

THE
STUDENT'S
ATLAS
OF
ARTISTIC ANATOMY
BY
PROF. C. ROTH.

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OF
ARTISTIC ANATOMY



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THE STUDENT'S
A T L A S
OF
ARTISTIC ANATOMY

BY

CH. ROTH

Professor of Sculpture at the Royal Academy, Munich

EDITED, WITH AN INTRODUCTION

BY

C. E. FITZGERALD, M.D.

Surgeon Oculist in Ordinary to the Queen in Ireland

WITH TWENTY-FOUR PLATES AND TEN EXPLANATORY FIGURES

NEW YORK: B. WESTERMANN & CO., 812, BROADWAY.

1891

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AUTHOR'S PREFACE.



THE representation of the human figure in the nude has ever been the grandest, as it is the most difficult, task for the artist. There is an immense satisfaction for the intelligent artist in the full understanding of that which previously he has been unconsciously drawn to imitate. Science supplies Art with the means of studying the internal mechanism of the human body and of learning rightly to portray the outer form, which after all is only the physical expression of the mind within.

It is mainly by the aid of plastic anatomy that we perceive how the spirit presiding within the organism manifests itself. By plastic anatomy we see how the highest types of art, especially in sculpture, are transferred from Nature.

Little insight is shown into the moving springs of the human organism, if it be supposed that frequent copying of anatomical models suffices for this study. Mechanical imitation drags Art from its height into the dust. The aim of Art is not merely to represent man as he appears, but to portray the inner by means of the outer man. For this purpose mere technical dexterity is certainly insufficient. Such dexterity produces at the best a work superficially attractive, which no connoisseur would rate highly.

I am well aware that the study of anatomy cannot prevail against these forms of superficial excellence unaided. But in conjunction with genuine loving artistic activity it can unfold the laws of beauty, which are based simply and solely on the human form. The grouping of masses, the treatment of surfaces and lines—that is, the groundwork of beauty—will by this study become clear to the artist's mind; and when once the essence of these studies has penetrated his being and informed his spirit, he will be no longer a workman, but a creator.

AUTHOR'S PREFACE.

Experience has taught me how unwilling artists are to study from text-books or from the corpse: in order that this may no longer be absolutely necessary, I have endeavoured to present my observations on the corpse and the model compared with the antique in as characteristic a plastic form as possible, and to provide for students a true picture of the living forms of the parts of the body touched upon, to supplement the lectures at art schools and academies. How far I have succeeded in this object I leave the artist to judge; it has been my desire to offer him in this work more than a mere treatise of the human frame could furnish him with.

Drawing after casts of anatomical preparations, where an attempt is made by the student to cram himself with forms in too great haste, has greater disadvantages than is commonly supposed. This is due in part to the use of preparations from subjects wasted by illness, which one is frequently compelled to employ for casts of this kind; and in part to the frequent displacement of groups of muscles in such casts, so that a false idea is given of form, especially of the joints, and of the back and breast. This method can only produce advantageous results to the student, as far as Nature is concerned, if in anatomical lectures for artists more use is made of the pencil than of the forceps, and if in demonstrations from the living body more attention is paid to understanding the contour of the limbs than the action of the muscles.

The fat under the skin is of essential importance; varying in each individual, it fills hollows, combines masses, and softens harsh transitions, so that lines and forms blend gently and softly one into another. The elastic skin stretched over adapts itself exactly to the whole, and thus the inward thought finds its outward expression with great delicacy and beauty.

Only a misdirected zeal would sacrifice the whole effect to an idle display of knowledge, and would accentuate muscular forms where anatomical laws forbid it no less than the laws of beauty. In this respect Greek Art is worthy of the highest honour; we can trace in its most subtle gradations a searching knowledge of the human body, displayed without the slightest ostentation.

CH. ROTH.

INTRODUCTION.



It cannot but strike, even a superficial observer, that one of the most remarkable differences between the English Art Student and his foreign *confrère*, is the greater ability displayed by the latter in his delineation of the nude. This is not confined to mere *technique* alone, but manifests itself in a more thorough and comprehensive grasp of the body as a whole, together with a deeper insight into its truly artistic meaning, or, as Professor Roth puts it, the portrayal of the inner by means of the outer man. This all-important result, the attainment of which should be the highest aim of the true artist, can only be accomplished by a laborious, and at the same time loving study of the nude. The most careful drawings and studies of the antique can never give that freedom and innate vitality which is only to be acquired by the contemplation and incessant study of the living model. It is in this particular that the English school is defective. Too much importance is attached by it to the study of the antique, too little to that of the living model; whereas, one of the most forcible lessons taught by those master-pieces of antiquity is, that their creators were ardent students of Nature, and that she was the prime source of their inspiration. “Art,” says Sir Thomas Browne, in his immortal *Religio Medici*, “is the perfection of Nature”; and no better definition of what true Art is was ever penned.

A knowledge of the wondrous mechanism underlying the form, which is the immediate object of the artist’s attention in the study of the nude, must necessarily prove of enormous value, not only as an aid to correct drawing, but also to the true interpretation of movement. Difficulties of various kinds stand in the way of Art Students acquiring such a knowledge of anatomy as will prove useful in their studies; and the object of the present valuable work is the removal of those difficulties. In it the student is not wearied with the dry details inseparable from an

INTRODUCTION.

elaborate work on anatomy,—such, for instance, as the origins, insertions, and relations of the muscles. These are but lightly touched upon, and only so far as they appear to have any practical bearing on the Art Student's work.

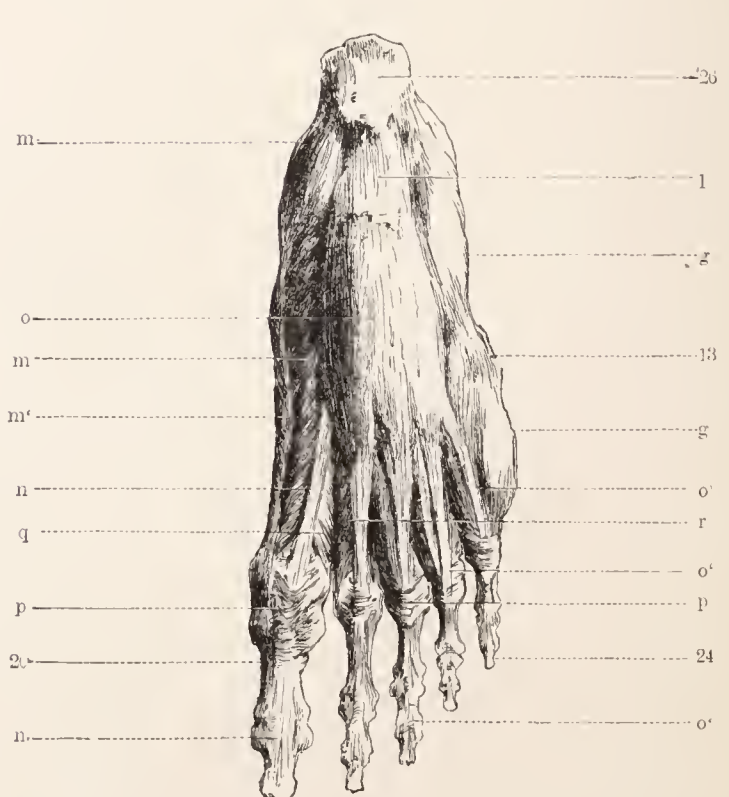
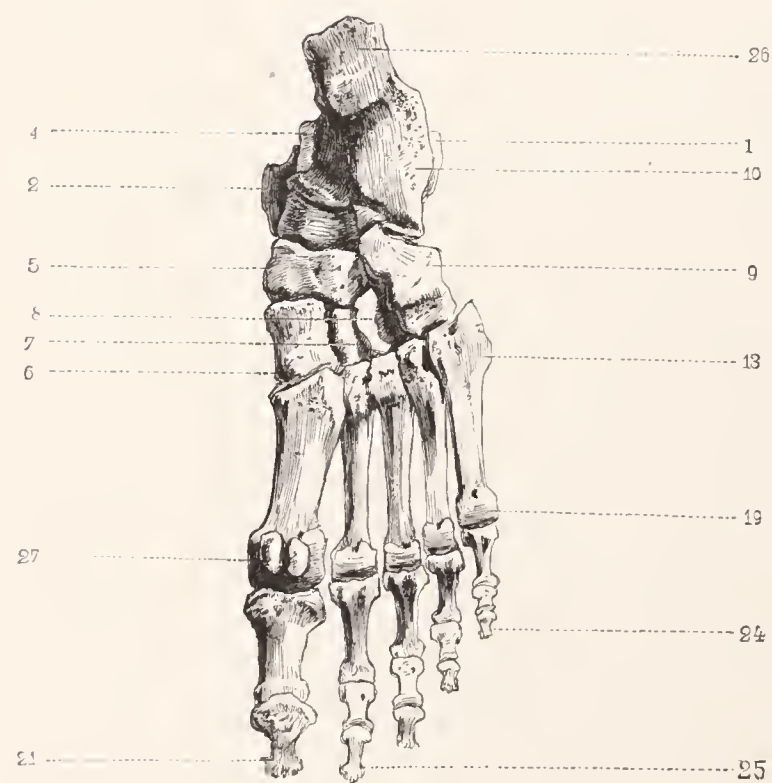
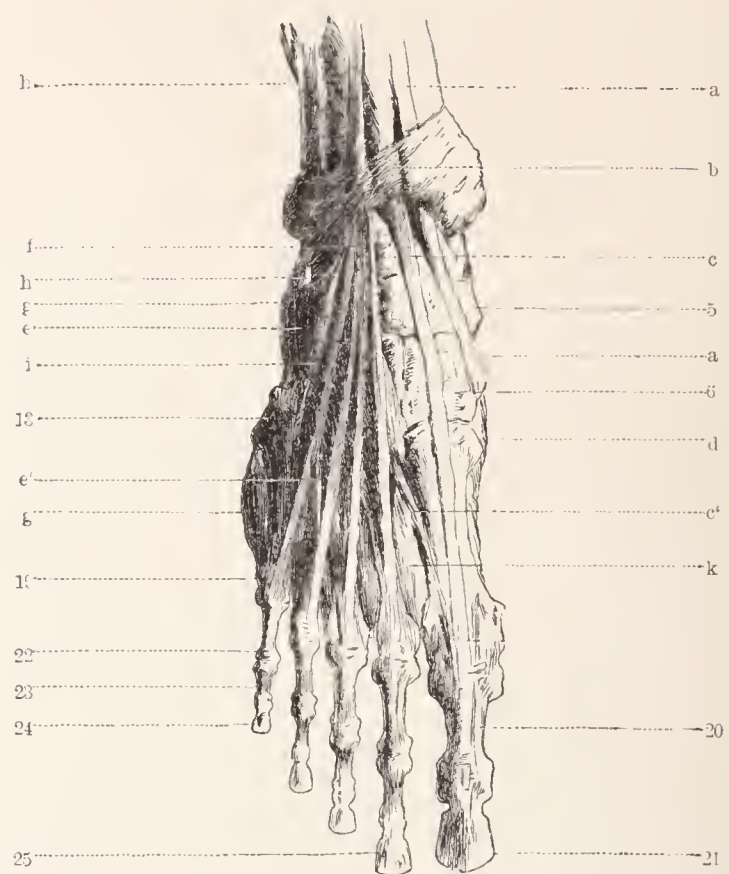
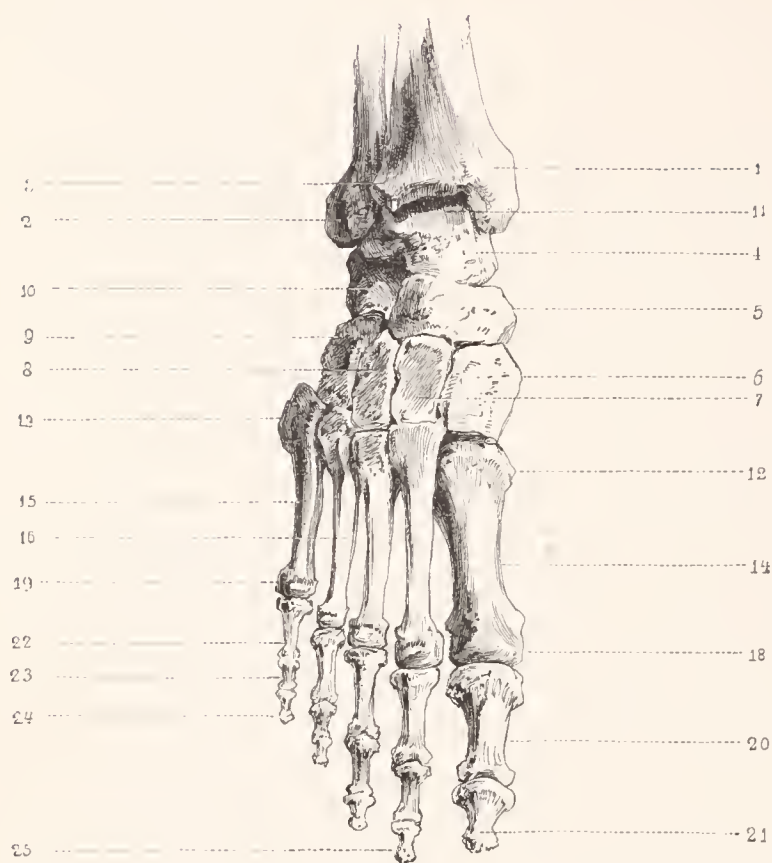
The plan adopted by Professor Roth in his Atlas is both simple and convenient. The two first plates represent the bony framework of the body, and the eight following ones the muscular structures in a condition of intense activity. Each carefully drawn figure-plate is followed by a similar explanatory one, in which the several parts depicted are numbered. The numbers refer to the text, which contains the names of the various bones and muscles. The author has also appended some notes directing attention to those points which are of special interest to the artist.

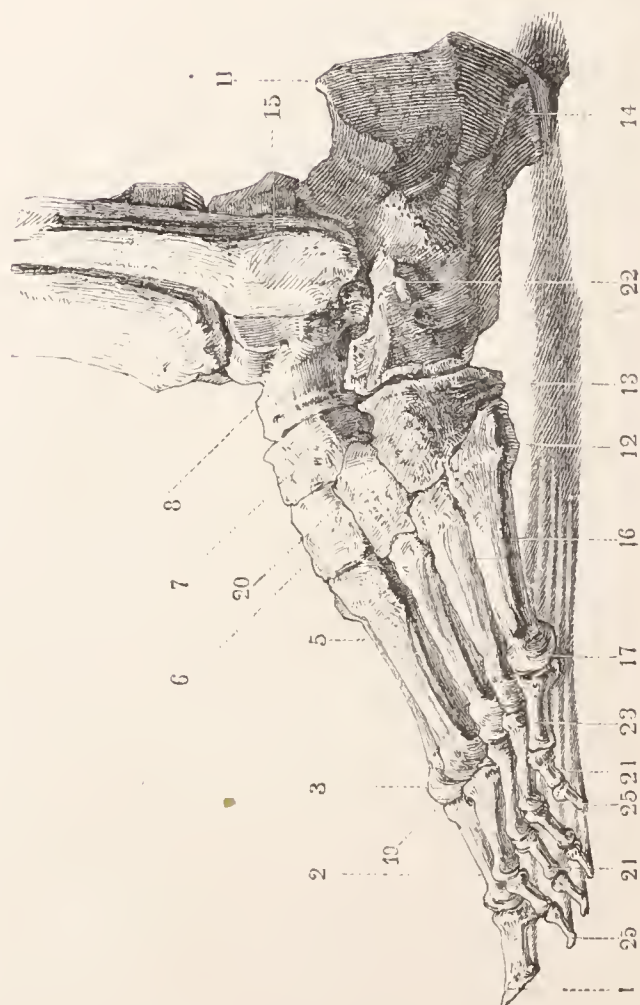
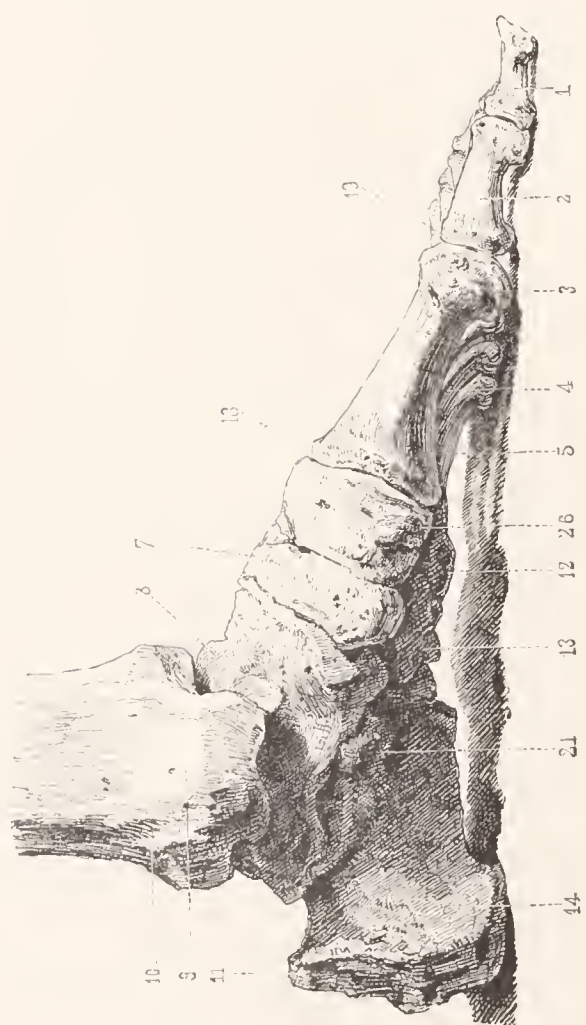
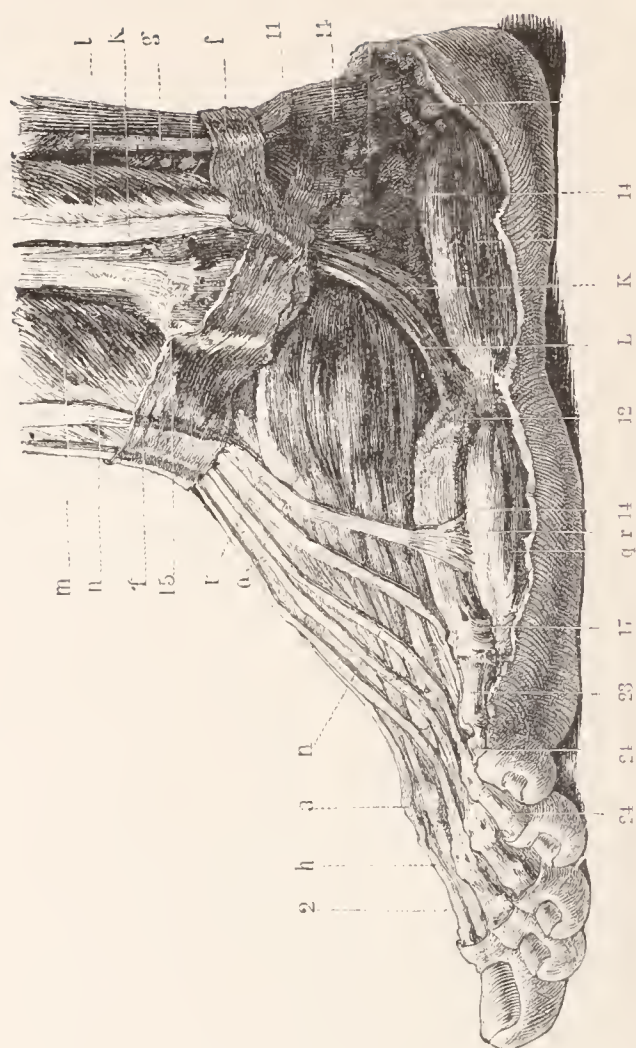
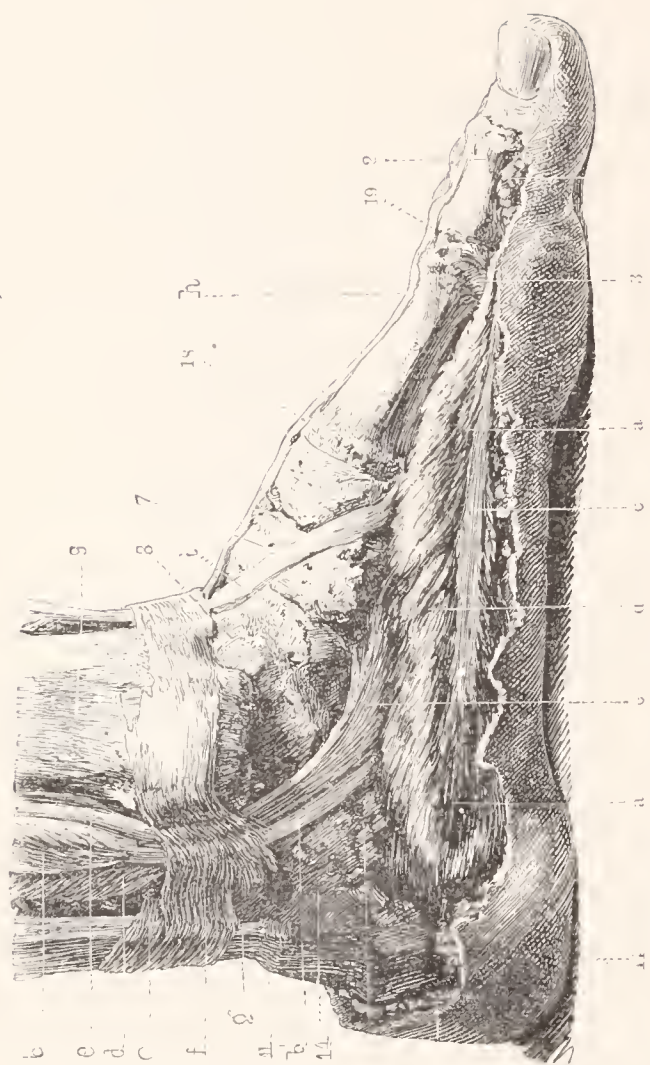
The original Atlas consisted merely of the Plates just mentioned; but subsequently Professor Roth added fourteen sectional, or enlarged Plates, of those parts of the body which appeared to require a more detailed examination.

Such a work as this must prove a welcome boon to the Art Student, and will repay his careful perusal, adding, as it is certain to do, increased interest to his study of the living model.

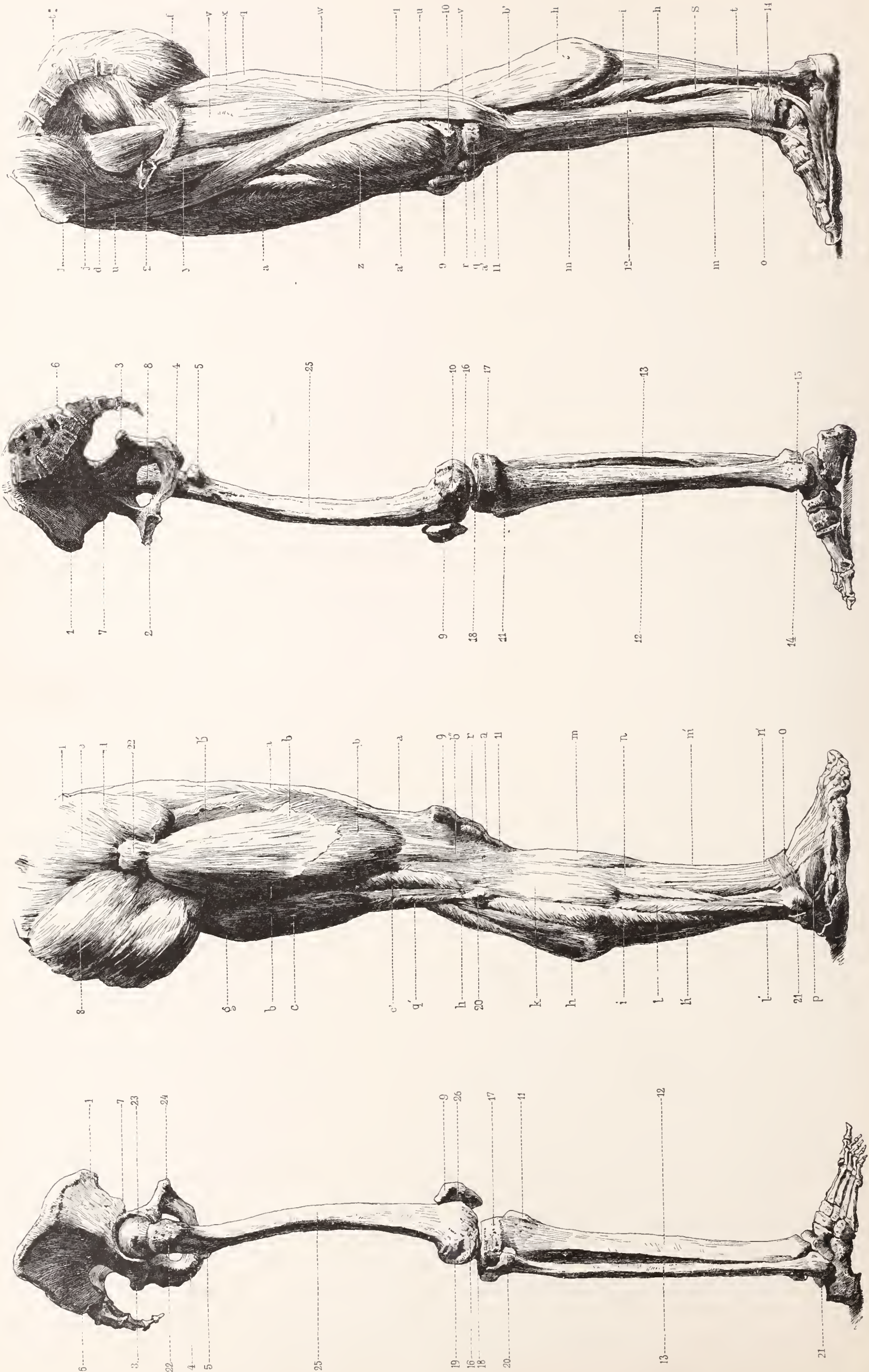
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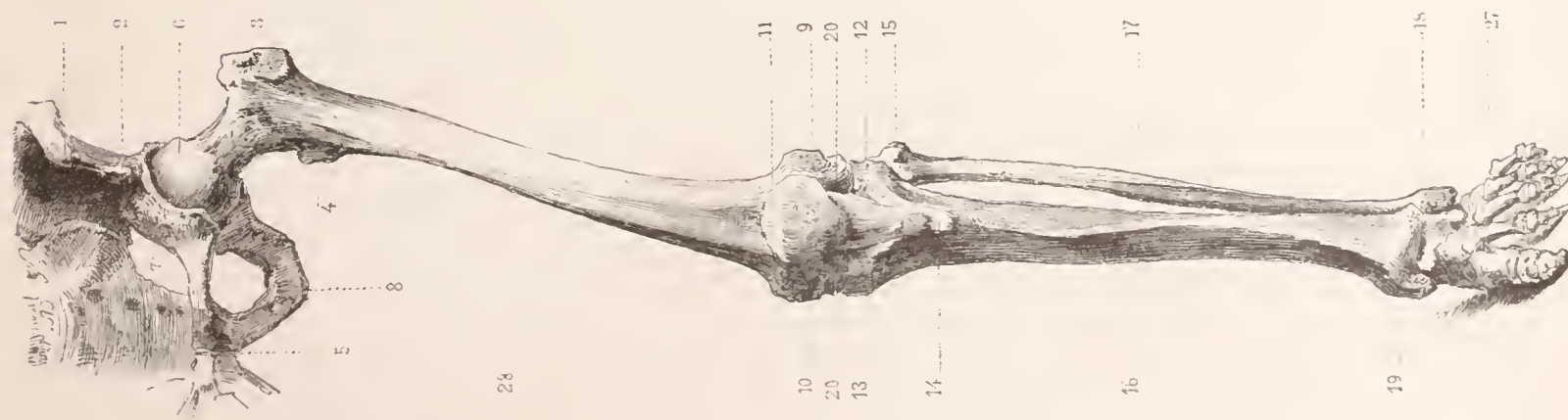
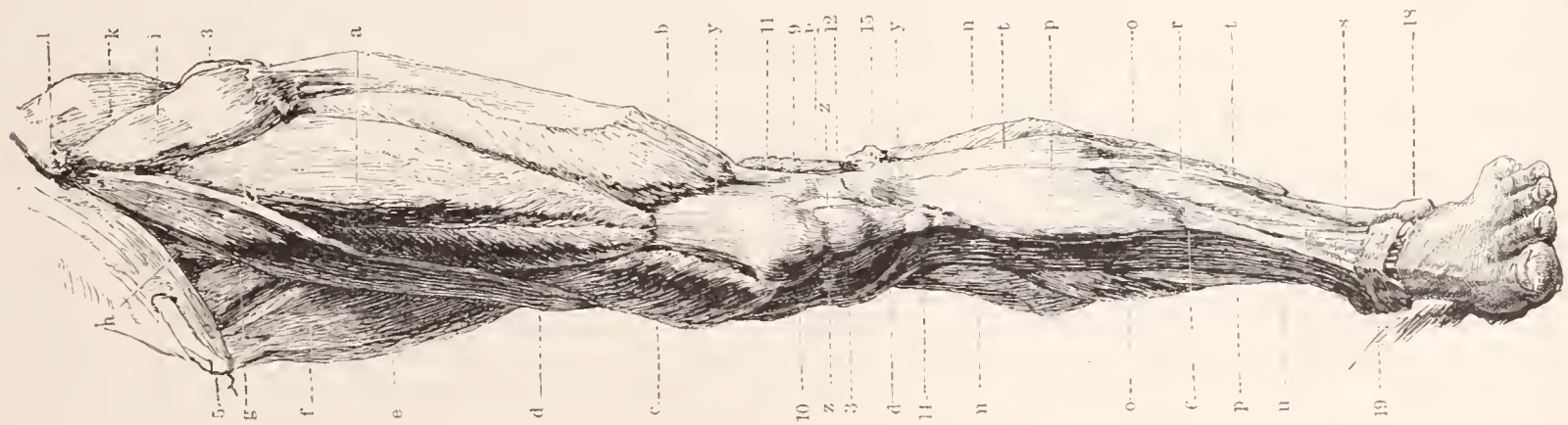
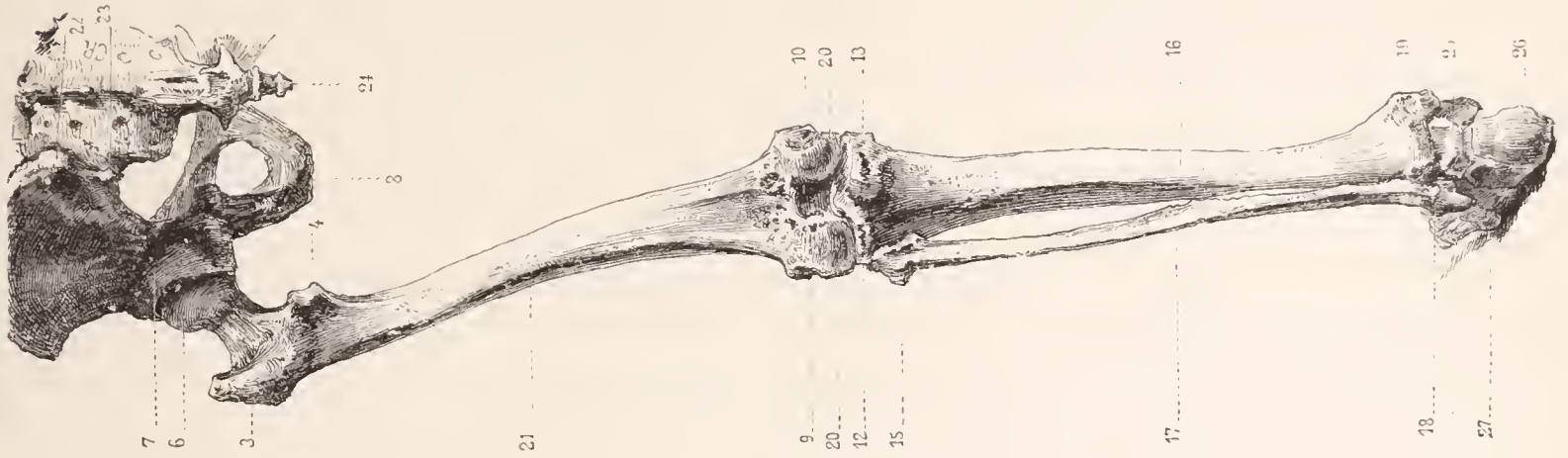
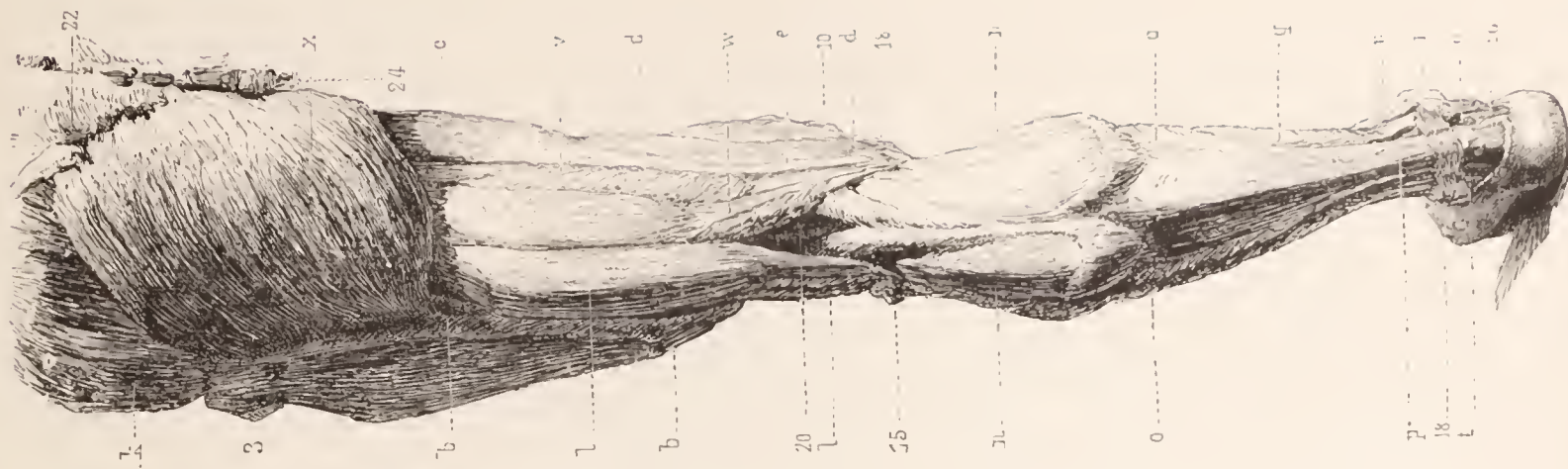
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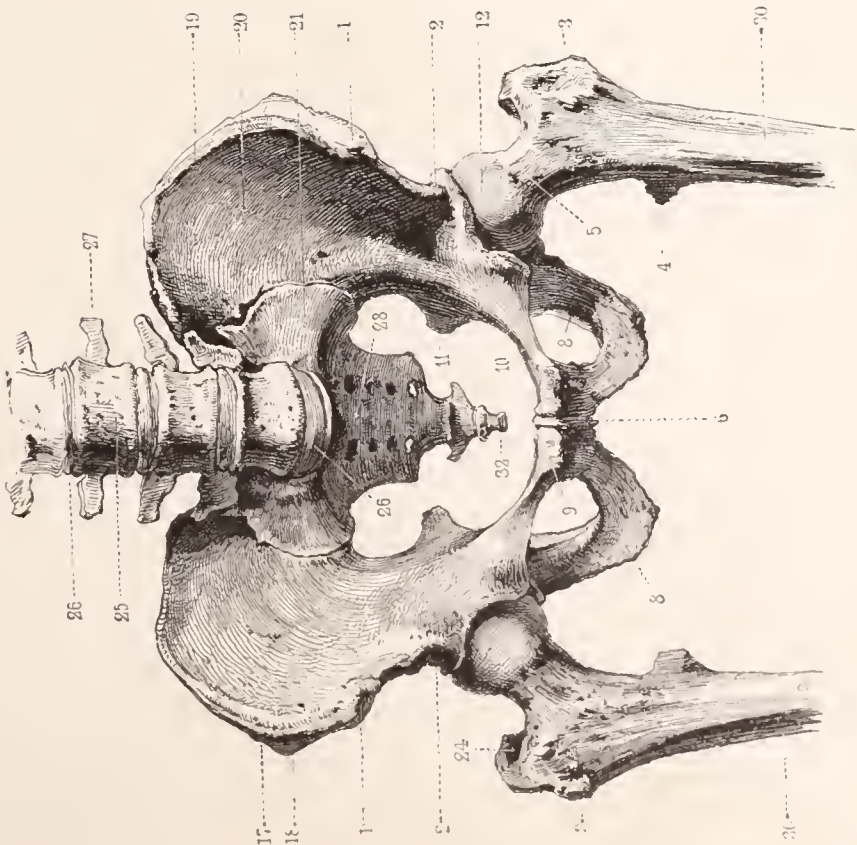
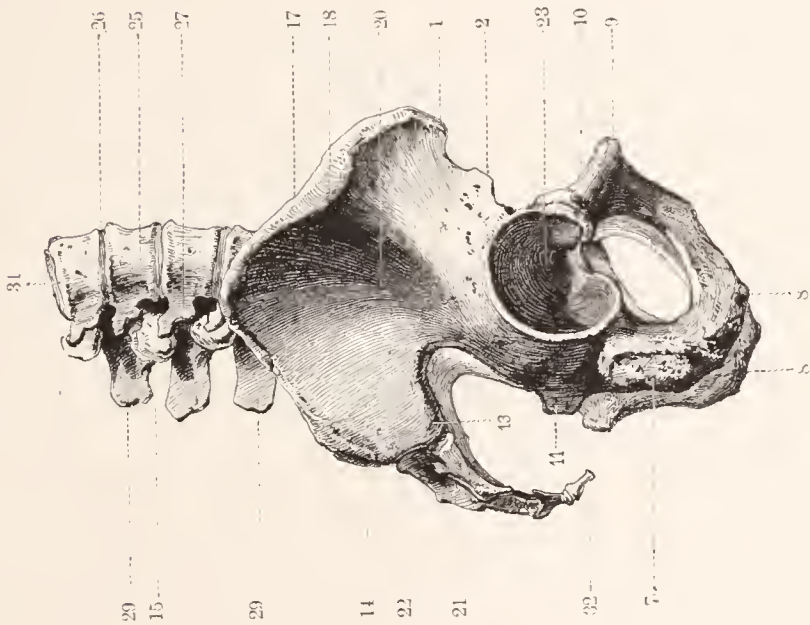
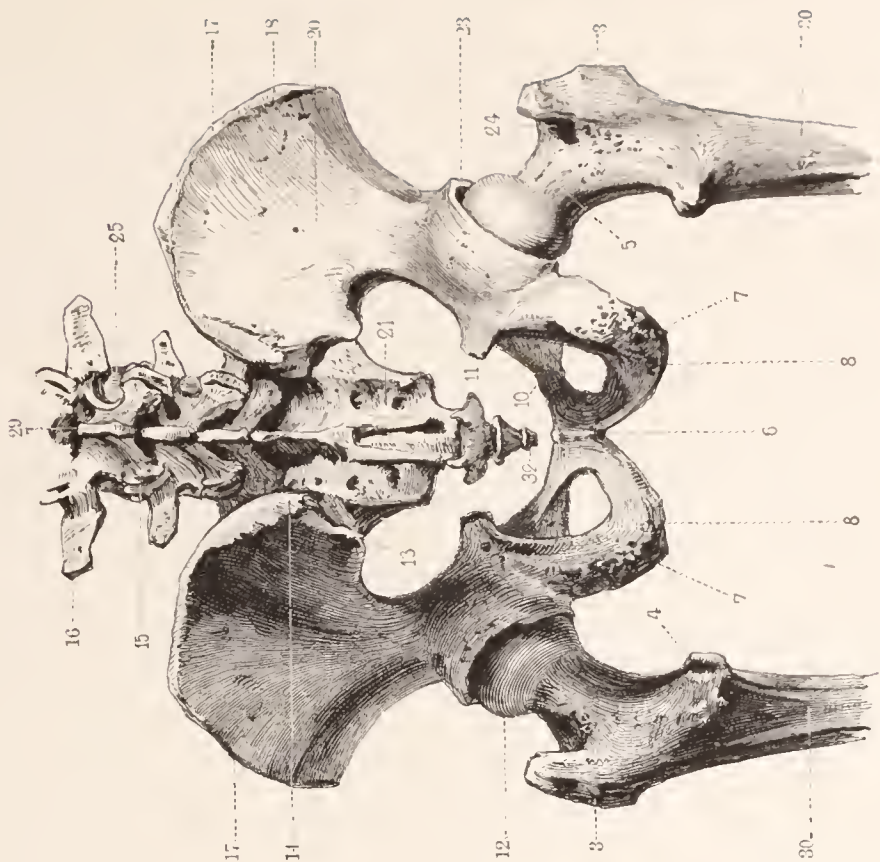


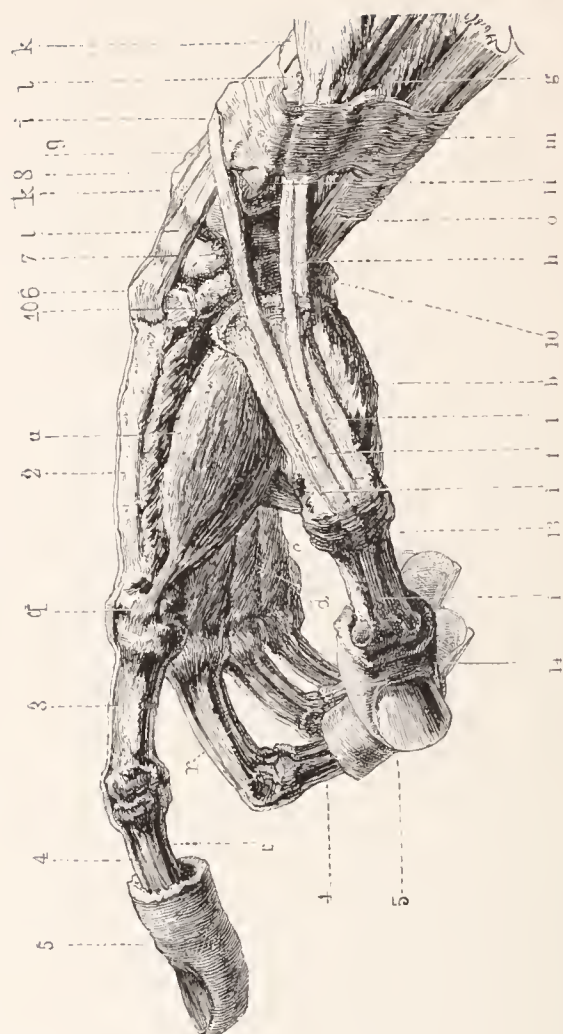
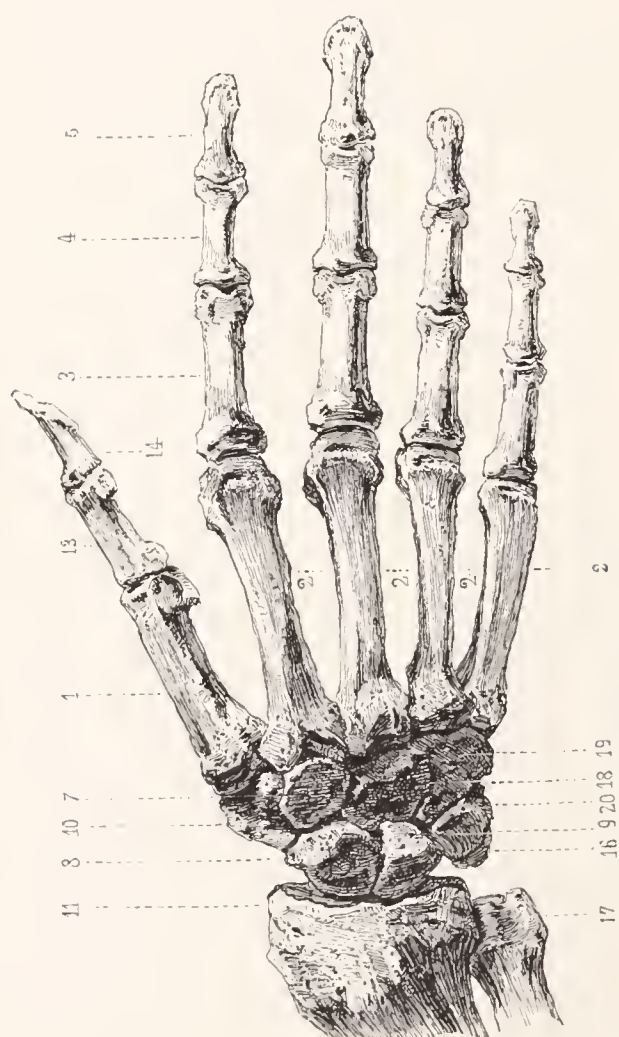
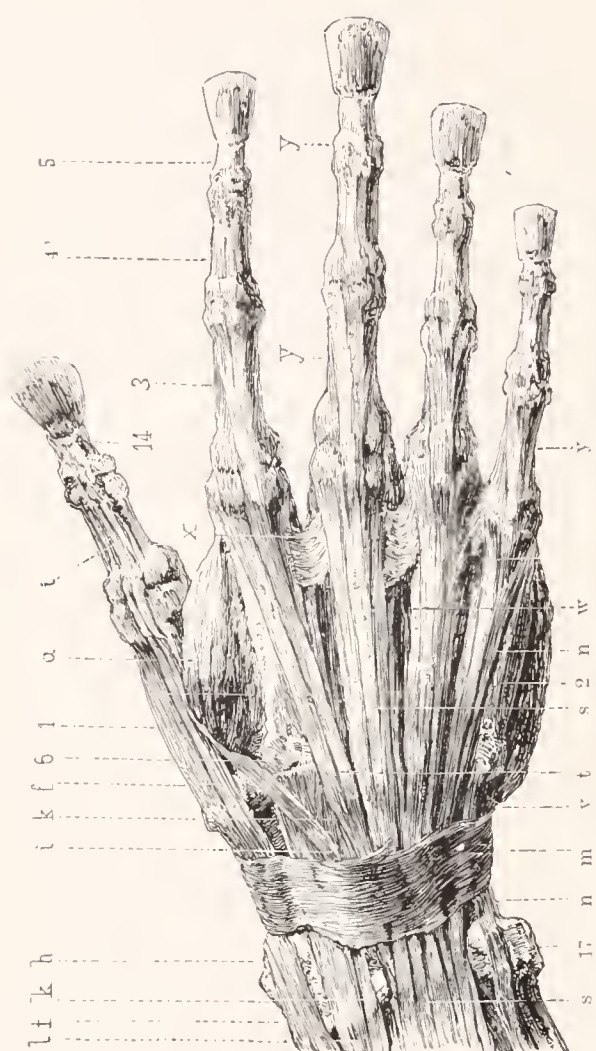


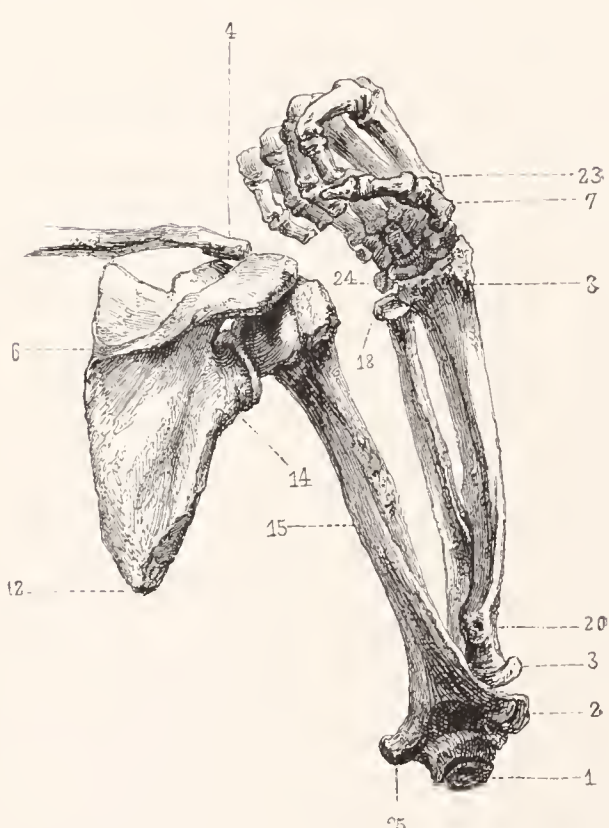
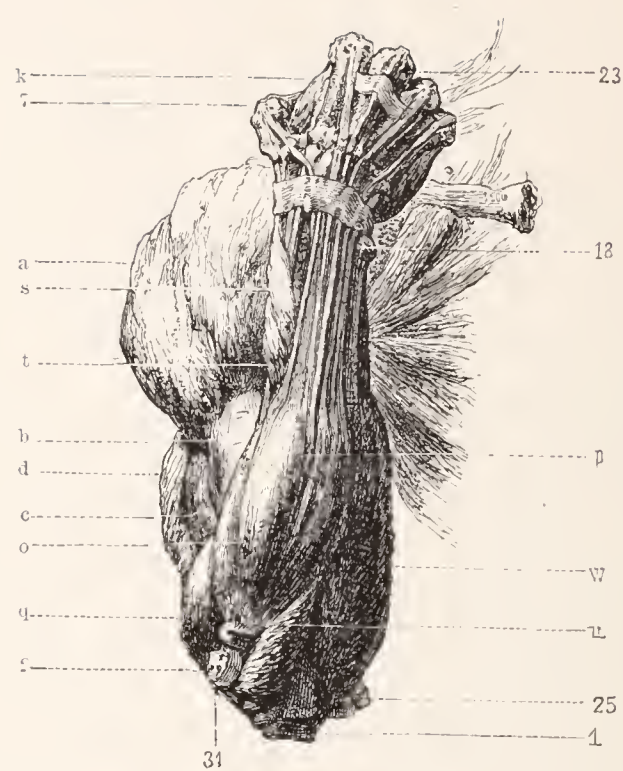
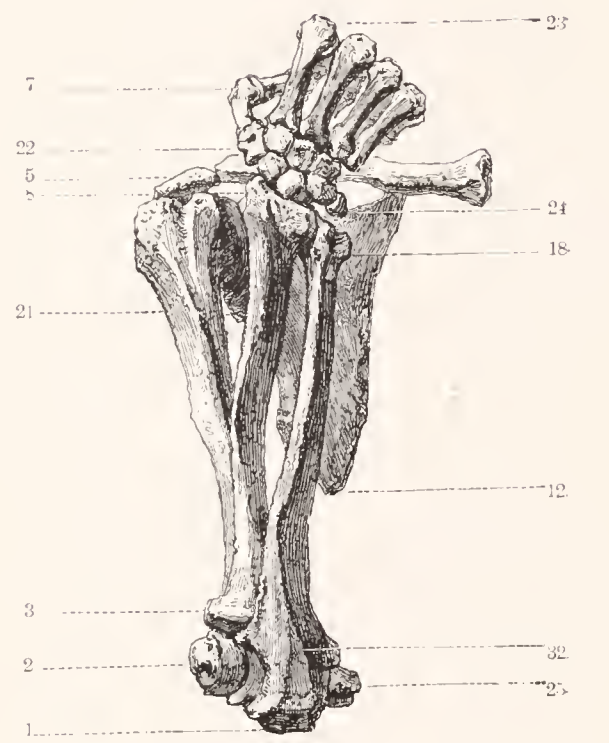


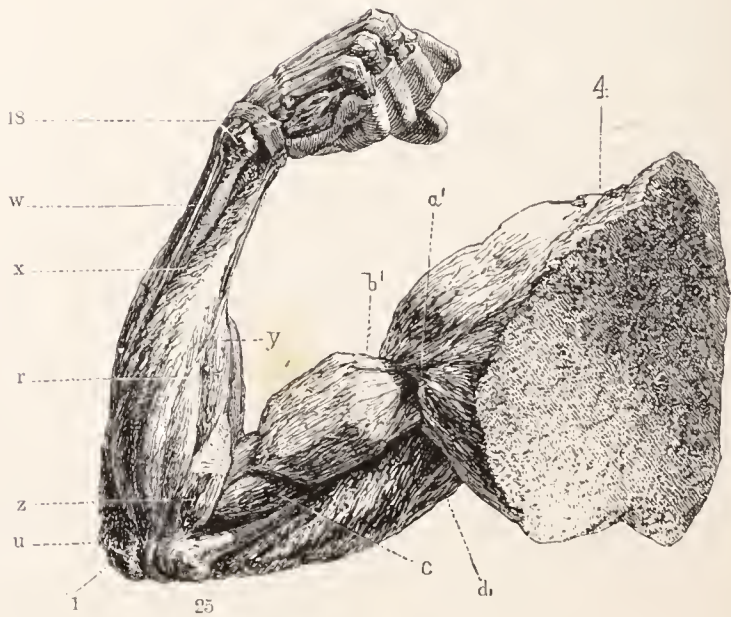
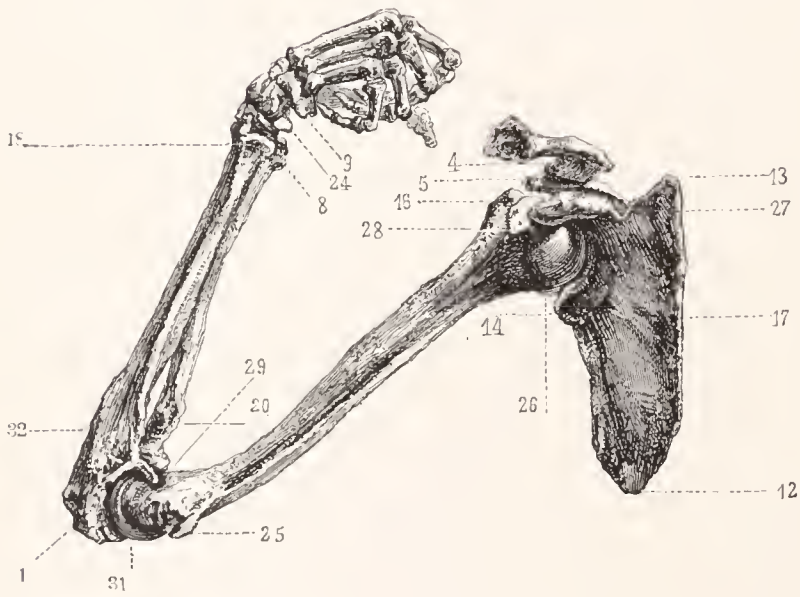
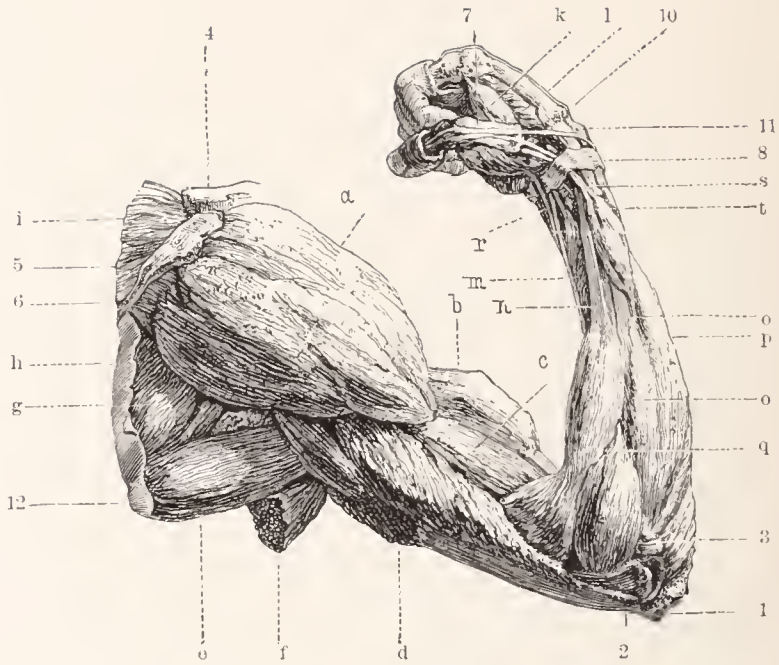
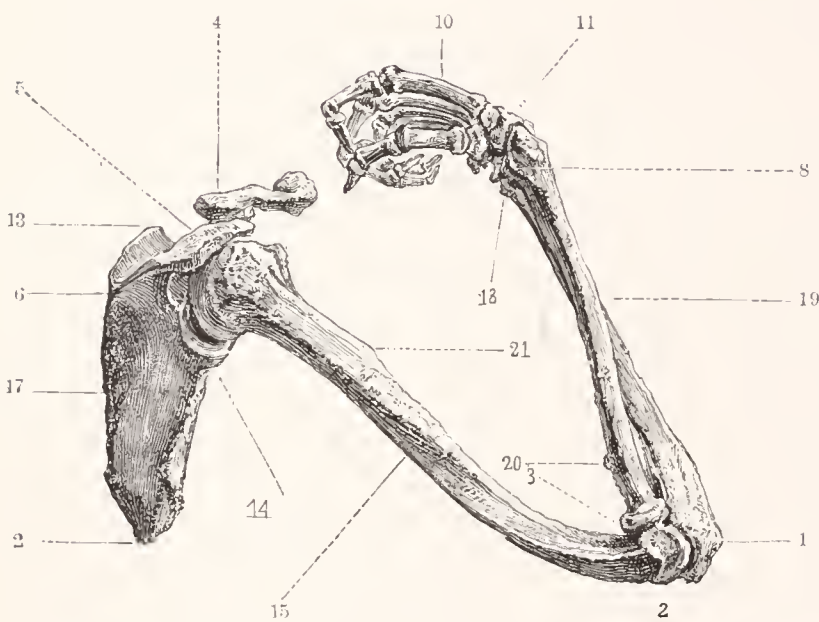


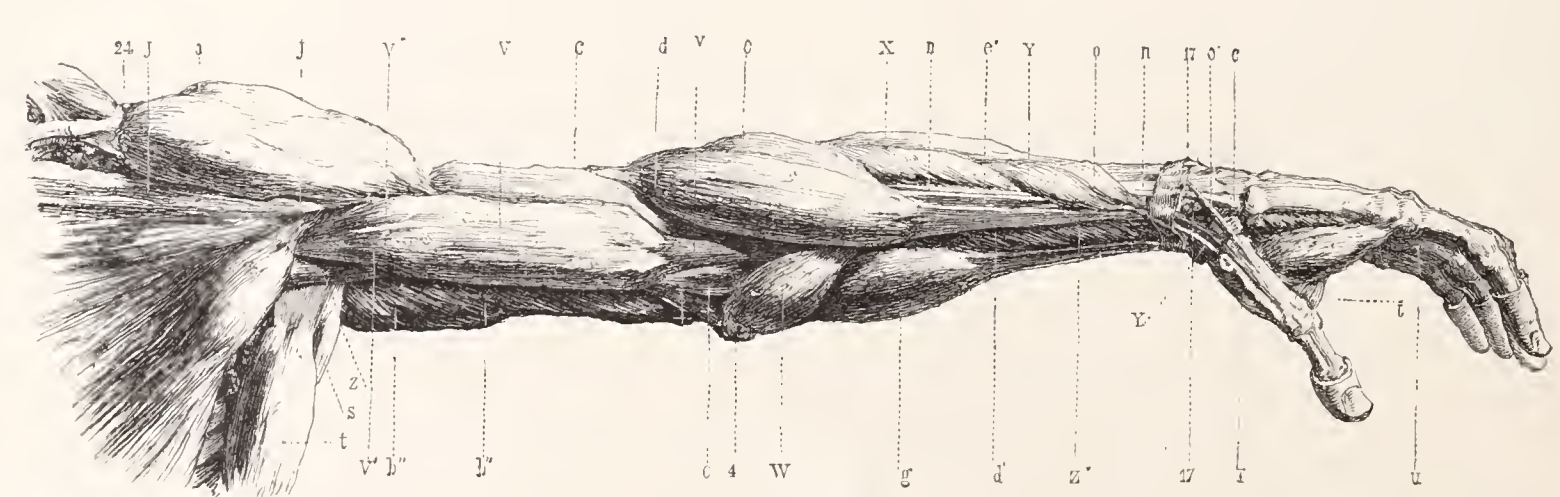
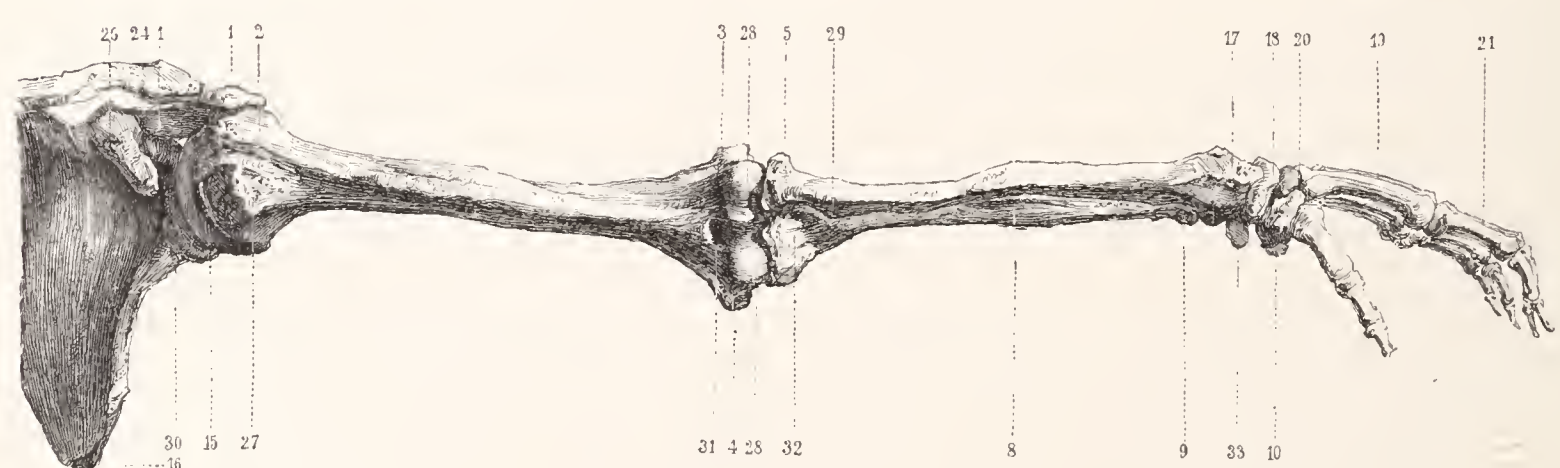
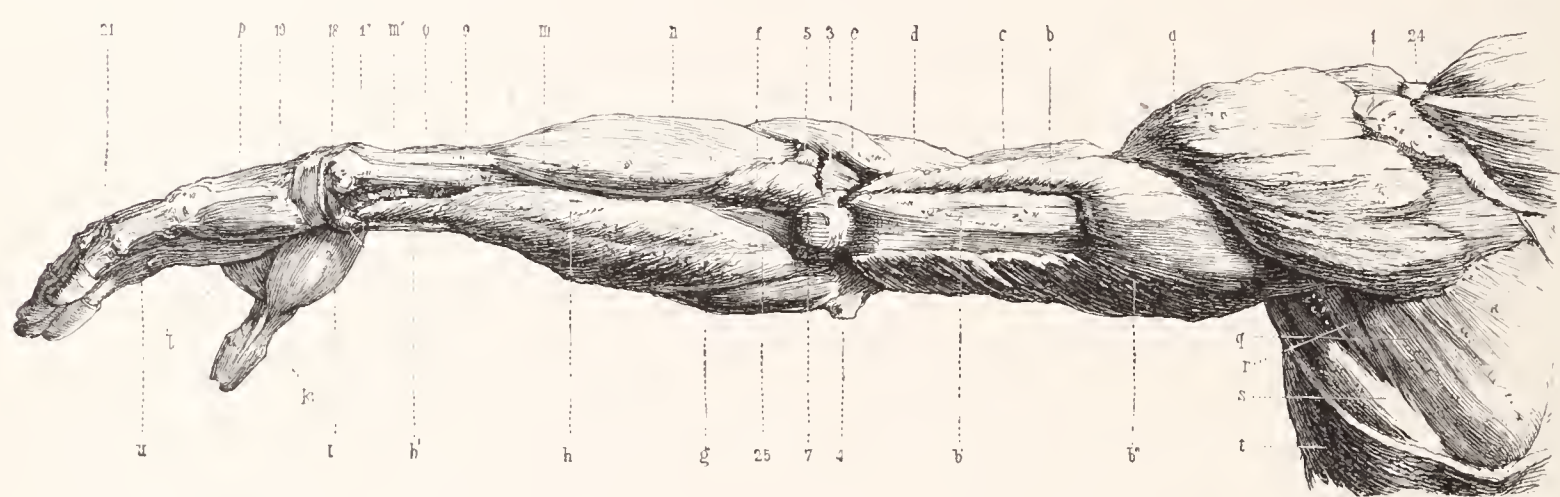
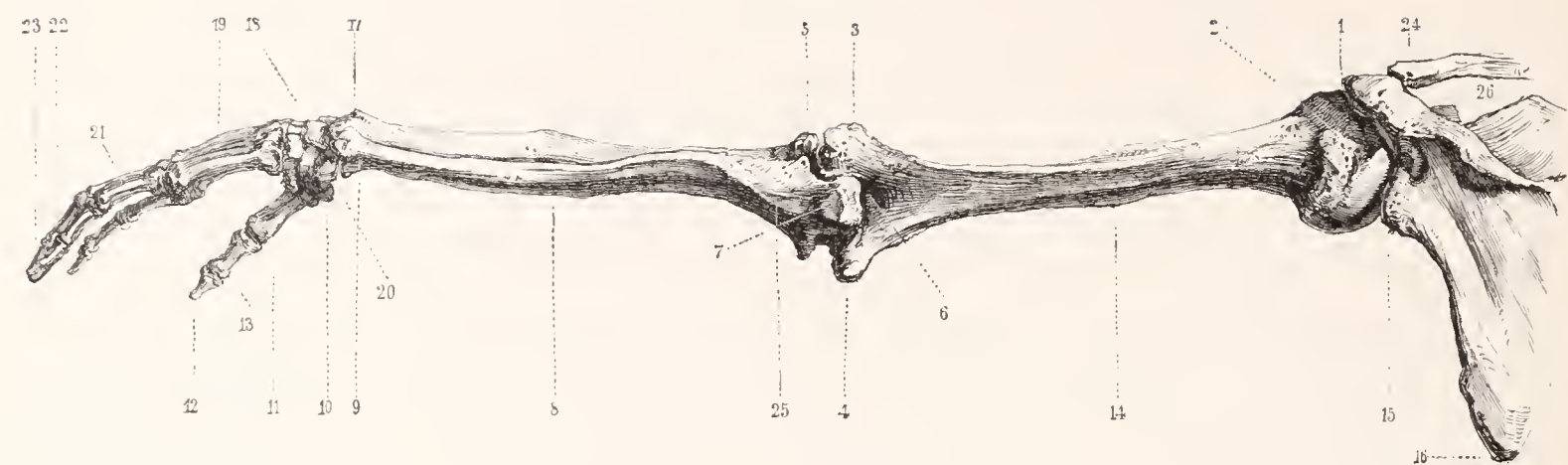


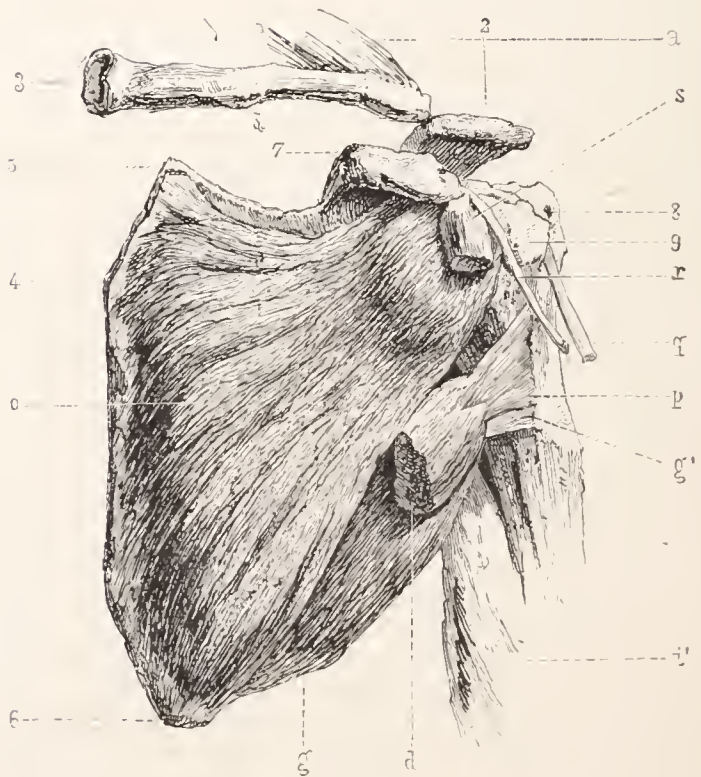
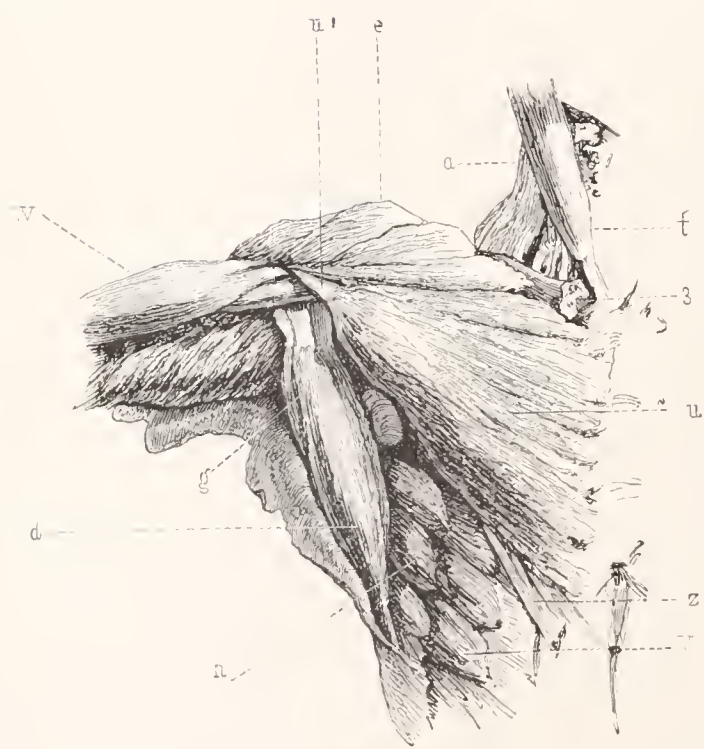
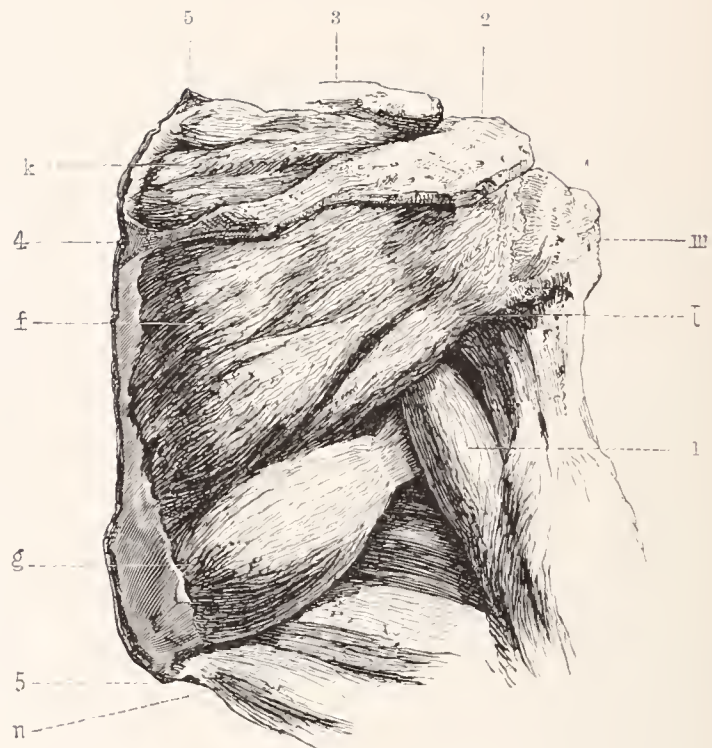
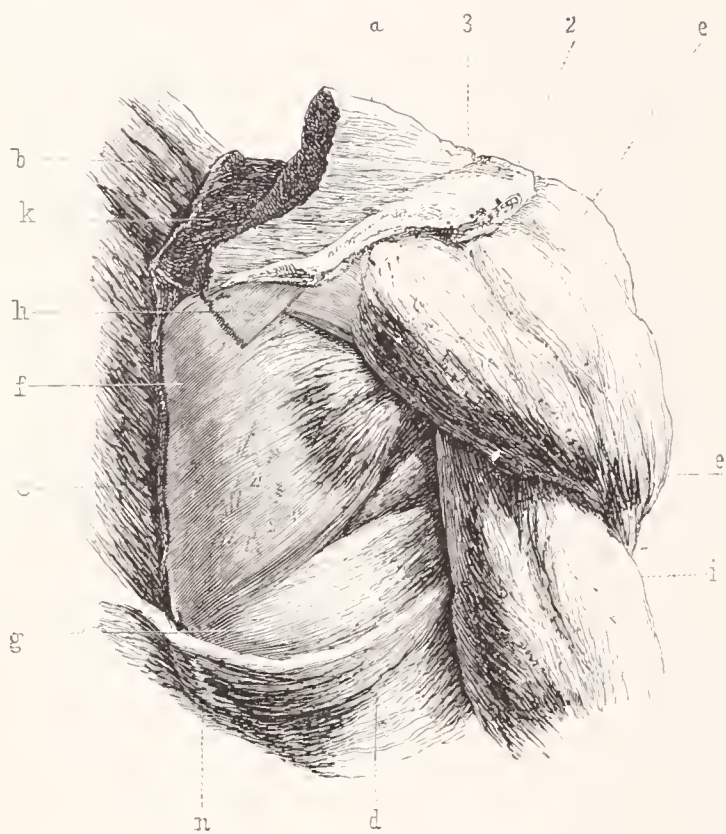












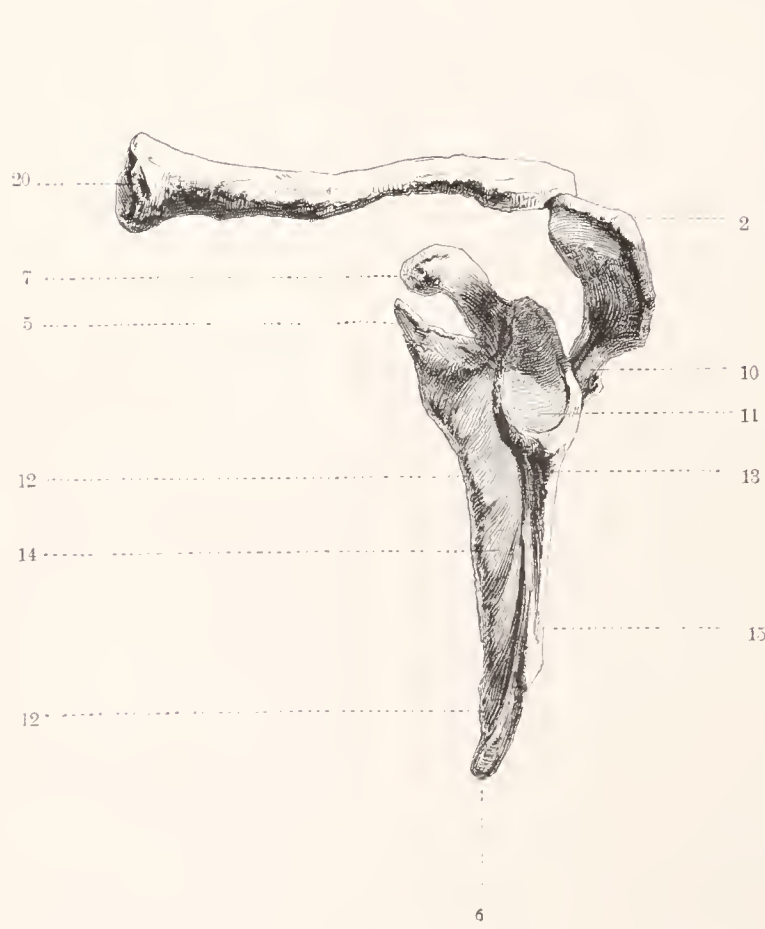
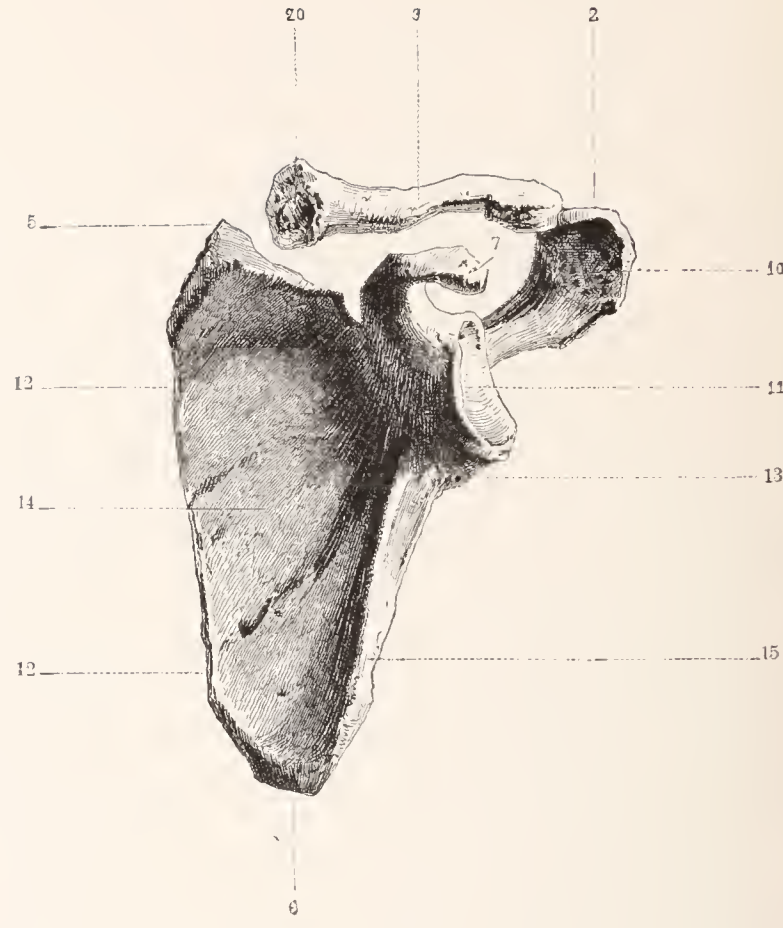
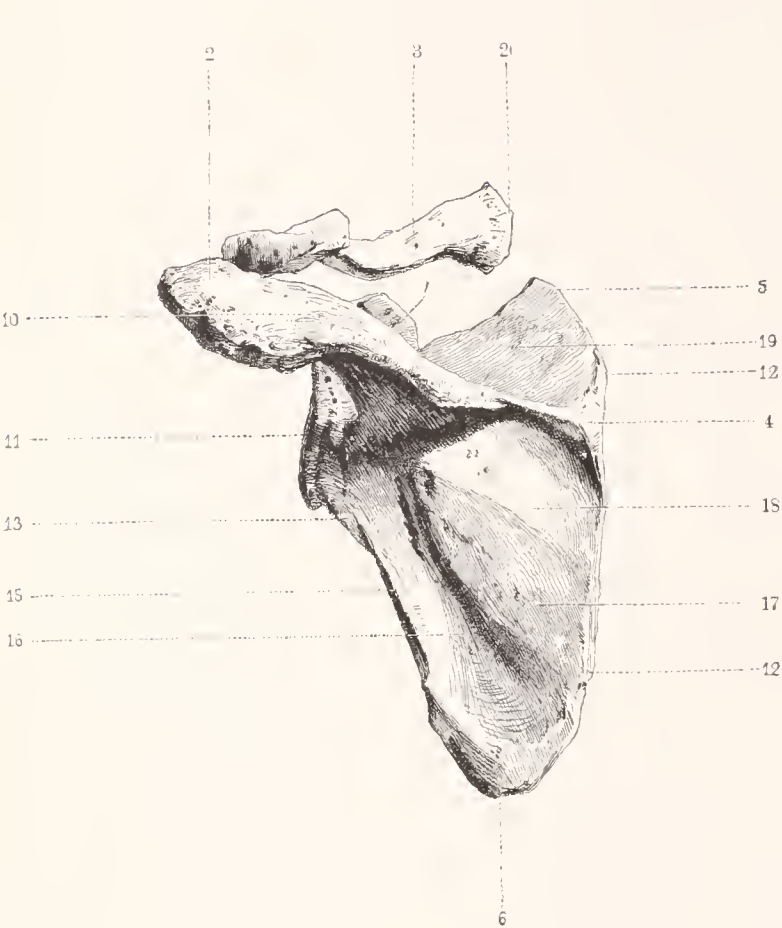


PLATE I.

Skeleton of the Athlete.

- | | |
|--------------------------------------|-----------------------------------|
| 1. Frontal bone. | 17. Nasal bone. |
| 2. Parietal bone. | 18. Atlas. |
| *3. Occipital bone. | 19. Clavicle. |
| 4. Spine of occipital bone. | *20. Acromion process of scapula. |
| 5. Mastoid process. | 21. Coracoid process of scapula. |
| 6. External auditory meatus. | *22. Manubrium sterni. |
| 7. Temporal bone. | *23. Ensiform cartilage. |
| 8. Zygomatic arch. | *24. Inferior angle of scapula. |
| 9. Malar bone. | *25. Head of humerus. |
| 10. Nasal spine of superior maxilla. | *26. Great tuberosity of humerus. |
| 11. Upper jaw. | 27. Lesser tuberosity of humerus. |
| 12. Lower jaw. | 28. Bicipital groove of humerus. |
| 13. Condyle of lower jaw. | 29. Surgical neck of humerus. |
| 14. Coronoid process of lower jaw. | 30. Inner condyle of humerus. |
| *15. Angle of lower jaw. | 31. Outer condyle of humerus. |
| 16. Upper margin of orbit. | 32. Trochlear surface of humerus. |

NOTES.

*3. See Plate XI. 3.

*15. See Plate XI. 6.

*20. See Plate XIII. 2.

*22. The attitude of the articulations of the skeleton (in Plates I. and II.) as well as its general relations, are imagined and represented as in the living being. The chest is widely distended through a deep inspiration (see Plate I.), in order to give strongly fixed points to the muscles which are thrown into action by the weight about to be lifted up. These fixed points cease to exist immediately on the emptying of the chest. A true and beautiful shape of thorax can, indeed, only be appreciated through a study of the living model, since with the last breath of life this outline is already more or less dependent upon the action of gravity. Very often one seeks to find errors in the organism,

and to weaken its mechanical relations through "artistic conception," without in any way considering that the highest ideal can only be founded on the basis of a healthy perception of nature; and that a spiritual living expression can only be gained by the true rendering of the form of an organism capable of life, and without which every other production becomes an inanimate and miserable figure, which, in the most favourable case, can only dazzle through its ingenuity.

*23. See Plates III., V., XXII.

*24. For details of the shoulder-blade see Plate XII.

*25. See Plate XIV.

*26. Is placed, when the arm is placid and hanging down, forwards and outwards. The lesser tuberosity lies forwards and inwards (see Plate XIII.).

PLATE I. SKELETON OF THE ATHLETE—*continued*.

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| <p>*33. Coronoid fossa of humerus.
 34. Coronoid process of ulna.
 35. Ulna.
 36. Radius.
 37. Lower end or head of ulna.
 38. Head of radius.
 39. Bicipital tuberosity of radius.
 *40. Styloid process of radius.
 41. Carpus.
 42. Trapezium.
 43. Metacarpus.</p> | <p>*44. Metacarpal bone of thumb.
 45. First phalanges.
 46. Second phalanges.
 47. Third phalanges.
 48. Seventh rib.
 *49. First rib.
 50. Ninth rib.
 *51. Tenth, eleventh, and twelfth ribs.
 *52. Vertebral column.
 *53. Seventh cervical vertebra (vertebra prominens).</p> |
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| <p>*33. The entrance of the coronoid process into the fossa intended for it, prevents the further bending of the arm (see Plates XIV. and XV.). The behaviour of the olecranon is the same during the act of straightening the arm (see Plate XIV.).
 *40. See Plate XVII.
 *44. By many authors the thumb is described as being three-jointed (see Plate XVII.).
 *49. The upper seven ribs are the true, the lower five the false ribs.</p> | <p>*51. In the drawing the anterior cartilaginous end of the tenth rib is removed; one or two of the last ribs "float" freely in the muscular tissue.
 *52. The vertebral column consists of twenty-four osseous rings, of which the first seven constitute the cervical, the next twelve the dorsal, and the last five the lumbar vertebræ.
 *53. The seventh cervical vertebra has the longest spinous process of the series (see Plates II., IV., VI.).</p> |
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PLATE II.

Skeleton of the Athlete.

Postero-external aspect.

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| <ul style="list-style-type: none"> *1. Frontal bone. 3. Occipital bone. 4. Spine of occipital bone. 5. Mastoid process. 8. Zygomatic arch. 9. Malar bone. 18. Atlas. *19. Clavicle. *20. Acromion process of scapula. *21. Coracoid process of scapula. 23. Ensiform cartilage. *24. Inferior angle of scapula. *25. Head of humerus. 30. Inner condyle of humerus. 31. Outer condyle of humerus. 32. Trochlear surface of humerus. 35. Ulna. | <ul style="list-style-type: none"> 36. Radius. 37. Lower end or head of ulna. 38. Head of the radius. 39. Bicipital tuberosity of radius. 40. Styloid process of radius. *41. Carpus. 42. Trapezium. 45. First phalanges. 48. Seventh rib. 50. Ninth rib. *51. Tenth, eleventh, and twelfth rib. 52. Vertebral column. *53. Seventh cervical vertebra ; vertebra prominens. 54. Twelfth dorsal vertebra. 55. First lumbar vertebra. *56. Sacrum. |
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NOTES.

In the plates of the skeleton, of the muscle-figure and of the complete-figure, one number indicates throughout the same muscle, bone, or cartilage. In order to distinguish the current number of the bony parts upon the explanatory plates of the muscle- and complete-figure from the muscles themselves, the former always have an asterisk *before* them ; therefore, on the explanatory plates, a number with an asterisk only indicates the bone, the one without the asterisk, the muscle.

This asterisk is naturally not present in the plates of the skeleton, but a figure accompanied by an asterisk on the explanatory plates of the muscle-figure as well as of the complete-figure, points always to the same part

as in the explanatory plates of the skeleton, but without the asterisk.

- *1. See Plate XI.
- *19. See Plate XII. 3.
- *20. See Plate XII. 2.
- *21. See Plates XII and XV.
- 24. See Plate XII. 6.
- *25. See Plate XIV. (arm).
- *41. See Plate XVII. 7.
- *51. See Plate I.
- *53. Has the longest spinous process. (See Plate II. and the plate of Athlete. IV., VI., VIII., X.)
- *56. See the pelvis plate, XVIII. 21.

PLATE II. SKELETON OF THE ATHLETE—*continued*.

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| <p>61. Sixth rib.</p> <p>*64. Crest of ilium.</p> <p>*65. Anterior superior iliac spine.</p> <p>66. Anterior inferior iliac spine.</p> <p>*67. Tuberosity of ischium.</p> <p>70. Symphysis pubis.</p> <p>*73. Femur.</p> <p>74. Head of femur.</p> <p>*75. Great trochanter.</p> <p>76. Lesser trochanter.</p> <p>77. Digital fossa.</p> <p>*78. Outer condyle of femur.</p> <p>79. Inner condyle of femur.</p> <p>*80. Patella.</p> <p>83. Tibia.</p> <p>84. Fibula.</p> <p>85. Crest of tibia.</p> <p>86. Inner tuberosity of tibia.</p> <p>87. Outer tuberosity of tibia.</p> <p>88. Head of fibula.</p> <p>90. Tubercle of tibia.</p> <p>92. Outer malleolus.</p> <p>93. Inner malleolus.</p> <p>94. Anterior border of tibia.</p> | <p>*95. Astragalus.</p> <p>98. Groove on tibia for tibialis posticus and flexor longus digitorum tendons.</p> <p>100. Os calcis.</p> <p>101. Tuberosity of os calcis.</p> <p>111. Third phalanges of toes.</p> <p>112. Terminal phalanx of great toe.</p> <p>113. Unciform bone.</p> <p>114. Olecranon.</p> <p>115. Olecranon fossa of humerus.</p> <p>116. Spine of scapula.</p> <p>117. Triangle at base of spine of scapula.</p> <p>118. First dorsal vertebra.</p> <p>119. Spinous process of first sacral vertebra.</p> <p>*120. Posterior superior iliac spine.</p> <p>121. Posterior inferior iliac spine.</p> <p>122. Coccyx.</p> <p>123. Pisiform bone.</p> <p>124. Linea aspera of femur.</p> <p>126. Articular surface of femur.</p> <p>127. Inter-condylar fossa of femur.</p> <p>128. Tuberosity of base of fifth metatarsal bone.</p> |
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NOTES.

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| <p>*64. See Plate XVIII. 17.</p> <p>*65. See Plate XVIII. 1.</p> <p>*67. See Plate XVIII. 7.</p> <p>*73. See the extended leg, Plates XIX. and XX.</p> <p>*75. A line drawn from the summit of one great trochanter to the other gives the axis upon which the trunk moves.</p> | <p>*78. See Plates XIX., XX., and XXI.</p> <p>*80. For details on the patella see Plates XIX., XX., and XXI.</p> <p>*95. See plates of the foot, XXIII. and XXIV.</p> <p>*120. See Plate XVIII.</p> |
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PLATE III.

Muscles of the Athlete.

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| *1. Frontalis muscle. | 26. Splenius capitis muscle. |
| 2. Aponeurosis of occipito-frontalis muscle. | *27. Trapezius muscle. |
| 3. Occipitalis muscle. | *28. Deltoid muscle. |
| 4. Temporal muscle. | *29. Pectoralis major muscle. |
| *5. Orbicularis palpebrarum muscle. | 30. Costal portion of same. |
| 6. Compressor nasi. | 31. Clavicular portion of same. |
| 7. Zygomaticus major muscle. | 32. Tendon of same. |
| 8. Zygomaticus minor muscle. | *33. Biceps muscle. |
| 9. Levator labii superioris alæque nasi. | 34. Long head of same. |
| 10. Levator anguli oris. | 35. Short head of same. |
| 11. Orbicularis oris. | *36. Tendon of biceps. |
| 12. Depressor anguli oris. | 37. Coraco-brachialis muscle. |
| 13. Depressor labii inferioris. | 38. Teres major muscle. |
| 14. Buccinator muscle. | *39. Triceps muscle. |
| *15. Masseter muscle. | 40. Long head of same. |
| 16. Digastric muscle. | 41. Outer head of same. |
| 17. Hyoid bone. | 42. Inner head of same. |
| *18. Larynx. | 43. Brachialis anticus muscle. |
| 19. Sterno-mastoid muscle. | 44. Supinator longus muscle. |
| *20. Sternal and clavicular portions of sterno-mastoid muscle. | 45. Pronator teres muscle. |
| 21. Sterno-hyoid muscle. | 46. Extensor carpi radialis longior. |
| 22. Omo-hyoid muscle. | 47. Extensor carpi radialis brevior. |
| 23. Mylo-hyoid muscle. | 48. Extensor carpi ulnaris. |
| 24. Scalene muscles. | *49. Anconeus muscle. |
| 25. Levator anguli scapulae. | *50. Extensor communis digitorum. |
| | 51. Extensor indicis. |

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| *1. See Plate XI. | *28. The deltoid consists of many bundles; in the raised arm three larger masses are particularly striking (see the plates of the Athlete). |
| *5. See Plate XI. <i>b</i> . | *29. See Plate XXII. <i>a</i> . |
| *15. See Plate XI. <i>i</i> . | *33. See Plate XIV. |
| *18. The obtuse-angled projection of the larynx is more noticeable in the adult man, than in woman. In young men it is not marked before puberty. | *36. A flat broad fasciculus passes from its internal margin obliquely downwards into the fascia of the arm (see Plate XV.). |
| *20. These two portions form together at their origin a triangular fossa (see Plates III., V., and XXII). The platysma myoides muscle is removed; it forms, in the relaxed skin of the aged, those well-known cords which extend from the chin to the neck. | *39. See Plates XIV., XV., XVI. |
| *27. See Plates IV. and VI. | *49. The anconeus appears here as the fourth head of the triceps (see Plate XVI. <i>u</i>). |
| | *50. See the hand, Plate XVII. |

PLATE III. MUSCLES OF THE ATHLETE—*continued*.

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| 52. Tendons of extensors of fingers. | 82. Gracilis muscle. |
| 53. Annular ligament. | *83. Rectus femoris muscle. |
| 54. Extensor longus pollicis. | 84. Crureus muscle. |
| 55. Extensor primi internodii pollicis. | 85. Vastus externus muscle. |
| 56. Extensor ossis metacarpi pollicis. | 86. Vastus internus muscle. |
| 57. Flexor longus pollicis. | 87. Tendon of quadriceps. |
| 58. Palmaris longus muscle. | 88. Tendon of vastus externus. |
| 59. Flexor carpi radialis. | 89. Tenth rib. |
| 60. Thenar eminence. | *90. Pad of fat about knee. |
| 61. First dorsal interosseous muscle. | 91. Semi-tendinosus muscle. |
| *62. Serratus magnus muscle. | 92. Semi-membranosus muscle. |
| *63. Rectus abdominis muscle. | *93. Femoral artery. |
| 64. Insertions of rectus muscle. | 94. Short head of biceps femoris. |
| 65. Lineæ transversæ. | 95. Tibialis anticus muscle. |
| 66. Linea alba. | *96. Extensor communis digitorum. |
| 67. Umbilicus. | 97. Tendon of same. |
| 68. Poupart's ligament. | 98. Peroneus longus. |
| 69. External inguinal ring. | 99. Peroneus brevis. |
| 70. Spermatic cord. | 100. Extensor longus pollicis. |
| 71. Testicle. | 101. Tibialis posticus. |
| 72. Suspensory ligament of penis. | 102. Flexor longus digitorum. |
| *73. External oblique muscle. | 103. Flexor longus pollicis. |
| *74. Gluteus maximus. | *104. Gastrocnemius muscle. |
| 75. Gluteus medius. | 105. Soleus muscle. |
| 76. Fascia lata. | 106. Tendo Achillis. |
| *77. Tensor vaginæ femoris. | 107. Anterior annular ligament. |
| 78. Ilio-psoas muscle. | 108. Extensor brevis digitorum. |
| *79. Sartorius muscle. | 109. Abductor pollicis. |
| 80. Pectineus muscle. | 110. Abductor minimi digiti. |
| 81. Adductor longus. | |

NOTES.

- *62. The serrations of the serratus magnus muscle, and of the external oblique muscle, require a conscientious study for their proper reproduction (see the plates of the Athlete).
- *63. The sheaths of the two recti abdominis muscles are entirely removed in order to show better the transverse divisions (see Plate XXII. *c*). The pyramidalis muscle is absent.
- *73. See Plates XXII. *d*, IV., VI.
- *74. See Plate XIX. *s*, IV., VI.
- *77. See Plates XIX. *i*, III., V.

- *79. See Plate XIX. *d*, and the plates of the Athlete.
- *83. See Plate XIX. *a*.
- *89. Very often only the two last ribs float, without connexion with the others, in the muscular tissue.
- *90. See Plate XIX. *z*.
- *93. Cut off after its exit from the pelvic cavity.
- *96. For details on the foot, see Plates XXIII, XXIV.
- *104. See Plate XIX. *n*, and the other plates of the Athlete.
[The figures marked with an asterisk on the explanatory plate No. 3 agree exactly with those on explanatory plate No. 1].

PLATE IV.

Muscular System of the Athlete.

Postero-external aspect.

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| 1. Frontalis muscle. | *42. Inner head of same. |
| 2. Aponeurosis of occipito-frontalis muscle. | *43. Brachialis anticus muscle. |
| 3. Occipitalis muscle. | *44. Supinator longus muscle. |
| 5. Orbicularis palpebrarum muscle. | *45. Pronator teres muscle. |
| *19. Sterno-mastoid muscle. | *46. Extensor carpi radialis longior. |
| 25. Levator anguli scapulæ. | *48. Extensor carpi ulnaris. |
| *27. Trapezius muscle. | *49. Anconeus muscle. |
| *28. Deltoid muscle. | *52. Tendons of extensors of fingers. |
| *33. Biceps muscle. | 53. Annular ligament. |
| *38. Teres major muscle. | *58. Palmaris longus muscle. |
| *39. Triceps muscle. | *59. Flexor carpi radialis. |
| *40. Long head of same. | *62. Serratus magnus muscle. |
| *41. Outer head of same. | *73. External oblique muscle. |

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| *19. See Plates V., VII. | *41. See Plate IV. 39. |
| *27. It arises from the superior curved line of the occipital bone, from the ligamentum nuchæ, the tips of the spinous processes of the seven cervical and the twelve dorsal vertebræ. Its muscular fibres are inserted into the upper margin of the spine of the scapula; it then passes forwards, and is also inserted on the inner margin of the acromion process of the scapula and to the end of the clavicle. In consequence of the course of its fibres it can raise the shoulder, and rotate the shoulder-blade outwards on its own axis. | *42. See Plate IV. 39. |
| *28. See Plate V. 28. | *43. See Plate V. 43. |
| *33. See Plate V. 33, III., VII. | *44. See Plate V. 44. |
| *38. It arises from the inferior angle of the scapula, passes upwards, and attaches itself by a flat tendon to the posterior bicipital ridge of the humerus. It rotates the arm somewhat inwards, and draws it towards the trunk. Next to it lies the broadest muscle of the back—that is, the latissimus dorsi (see Plates V., VI.). | *45. See Plate V. 45. |
| *39. The triceps muscle lies on the posterior surface of the humerus, and is the most powerful muscle for extension of the arm. Its long head arises from the outer margin of the shoulder-blade, under the glenoid cavity, and passes between the teres major and minor muscles. The outer head arises from the external surface of the humerus in the neighbourhood of the point of insertion of the teres minor muscle. The inner head arises from the inner surface of the humerus from the point of insertion of the teres major muscle down to the internal condyle. Its three heads unite together and form a thick belly, which is inserted by means of a broad flat tendon into the olecranon process (see Plates III., IV., V. and VI., and the figures of the Athlete, VII., VIII., IX., X.). | *46. Arises somewhat above the external condyle of the humerus, and runs along the outer side of the forearm. The extensor carpi radialis brevior arises directly from the external condyle, and while running in parallel directions is almost covered by the belly of the longior. In their further course they pass on the dorsal surface of the hand through the posterior annular ligament by a common channel, and attach themselves to the base of the metacarpal bone of the index and middle fingers. They extend the inwardly bent hand, and draw the back of the hand backwards (see Muscle-figure III. and Athlete-figure VII.). |
| *40. See Plate IV. 39. | *48. Arises from the external condyle of the humerus, and runs along the ulna downwards, in order to attach itself to the base of the metacarpal bone of the little finger. It extends the hand. |
| | *49. Arises from the external condyle of the humerus, and is inserted into the outer surface of the upper third of the ulna. Its action is similar to that of the triceps. |
| | *52. Arises from the external condyle of the humerus, divides itself into four bellies, which then become tendinous, and run side by side through the posterior annular ligament to the fingers (see Plate of the Hand XVII. y). |
| | *58. See Plate V. 58. |
| | *59. See Plate V. 59. |
| | *62. See Plate V. 62, and Plates of the Athlete III., IV., VII., VIII., IX. |
| | *73. See Plate V. 73, and Plates III., VII. |

PLATE IV. MUSCULAR SYSTEM OF THE ATHLETE—*continued*.

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| <p>*74. Gluteus maximus.
 *75. Gluteus medius.
 76. Fascia lata.
 *77. Tensor vaginæ femoris.
 *79. Sartorius muscle.
 *82. Gracilis muscle.
 *83. Rectus femoris muscle.
 *85. Externus vastus muscle.
 *86. Internus vastus muscle.
 *87. Tendon of quadriceps.
 88. Tendon of vastus externus.
 *90. Pad of fat about knee.
 *91. Semi-tendinosus muscle.
 *92. Semi-membranosus muscle.
 *94. Short head of biceps femoris.
 *95. Tibialis anticus muscle.
 *96. Extensor communis digitorum.
 *98. Peroneus longus.
 *99. Peroneus brevis.</p> | <p>*102. Flexor longus digitorum.
 *104. Gastrocnemius muscle.
 *105. Soleus muscle.
 106. Tendo Achillis.
 107. Anterior annular ligament.
 *108. Extensor brevis digitorum.
 *109. Abductor pollicis.
 *110. Abductor minimi digiti.
 *111. Hypothenar eminence.
 *112. Flexor carpi ulnaris.
 *113. Tendon of triceps.
 *114. Teres minor.
 115. Tendon of insertion of deltoid.
 *116. Latissimus dorsi.
 *117. Serration of same.
 *118. Rhomboideus muscle.
 *119. Infra-spinatus muscle.
 120. Infra-spinous fascia.</p> |
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NOTES.

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| <p>*74. Arises from the posterior and outer margin of the crest of the ilium, from the posterior surface of the sacrum, the lateral border of the coccyx, and the iliac and sacral ligaments. Its loose, coarse fibres run transversely downwards and outwards, turn forward towards the great trochanter, and form here a broad, strong tendon, which is inserted into the linea aspera of the femur; some of its superficial fibres are, however, adherent to the fascia lata (see Plate III.). It abducts the thigh and rotates it outwards (see Muscle-figures IV., VI., and the Athlete VII., VIII., X.).</p> <p>*75. See Plate XX. <i>c</i>. and Plates IV., VI., VII., VIII., X.</p> <p>*77. See Plate XX. <i>d</i>.</p> <p>*79. See Plates XX. and III., IV., V., VII., IX.</p> <p>*82. See Plates XX. <i>r</i>, III., IV., V., VII.</p> <p>*83. See Plate XX. <i>a</i>, XXI., and Muscle-figure III., IV., V., and Athlete VII., VIII., IX.</p> <p>*85. Through the stretching of the tensor vaginæ femoris a depression arises in the muscle, so that it appears as if divided.</p> <p>*86. See Plates XX. <i>z</i>, XIX., XXI., VII., VIII.</p> <p>*87. See Plates XX. <i>a</i>, XXI.</p> <p>*90. See Plates XX. and XXI. notes.</p> <p>*91. See Plates XX. <i>q</i>, and Muscle-figure III., IV., V., and Athlete VII.</p> <p>*92. See Plate XX. <i>w</i>.</p> <p>*94. See Plates XX. <i>c'</i>, XXI., and Athlete VII., VIII.</p> <p>*95. See Plates XX. <i>m</i>, and the Plate of the Athlete.</p> <p>*96. See Plates XX. <i>n</i>, XXIV.</p> <p>*98. See Plates XX. <i>k</i>, XIX., XXI., and Plates III. IV., VII., VIII.</p> <p>*99. See Plates XXI. <i>g</i>.</p> <p>*102. See Plates XX. <i>s</i>, XXIII.</p> <p>*104. Its heads of origin arise in the space which is formed by the flexor muscles of the thigh, and constitute the base of this triangular fossa (see Plates XX. <i>h</i>, VII., VIII., X.).</p> <p>*105. See Plates XX. <i>i</i>, XIX., XXI., and Plates of the Athlete V., VII., IX.</p> <p>*108. See Plates XXIII., XXIV.</p> <p>*109. See Plate XXIV. <i>d</i> and <i>m</i>.</p> | <p>*110. See Plate XXIV. <i>g</i>.</p> <p>*111. See Plate of the Hand XVII. <i>r</i>.</p> <p>*112. Arises from the internal condyle of the humerus and the outer side of the ulna, and from the olecranon; is partly penniform, and is inserted by a thick roundish tendon into the pisiform bone. It flexes the hand.</p> <p>*113. See Note 39 of this Plate.</p> <p>*114. It arises from the posterior margin of the scapula, and is inserted into the great tuberosity of the humerus; it is frequently fused with the infra-spinatus muscle. It rotates the arm outwards (see Plates IV. and XIII. 1).</p> <p>*116. It arises by a broad tendon from the four to six lower dorsal vertebræ, from all the sacral and lumbar vertebræ, and by three to four serrations from the posterior surfaces of the four lower ribs and the posterior part of the iliac crest. Its obliquely arising fibres become thicker towards the tendon, and this is inserted broadly into the bottom of the bicipital groove of the humerus. It curves round the teres major, covers the same partially, and thus forms the posterior wall of the axilla (see Plate V. 116). It draws the arm downwards and backwards (see Muscle-figures IV., VI., and figures of the Athlete VII., VIII., IX., X.).</p> <p>*117. See Plate VII. Athlete.</p> <p>*118. Consists of the larger and smaller rhomboid muscles. It arises from the spinous processes of the four upper dorsal vertebræ and the two lower cervical vertebræ. Its flat fasciculi pass obliquely downwards and upwards to be inserted at the base of the shoulder-blade. It is antagonistic to the trapezius muscle, and draws the shoulder-blade towards the mid-dorsal line (see Plate XIII.).</p> <p>*119. Arises from the space below the spine of the scapula, and passes over the shoulder-joint upwards towards the greater tuberosity of the humerus. Its action is in combination with the teres minor muscles, and rotates the arm outwards. It is covered by the trapezius muscle (see the prominent swelling in the Muscle-figure, Plate VI. 27, and the figure of the Athlete, X. 27).</p> |
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PLATE IV. MUSCULAR SYSTEM OF THE ATHLETE—*continued*.

*121. Erector spinæ muscle.

*122. Folds produced by the curving backwards of the spine.

*124. Biceps femoris.

*125. Long head of same.

*126. Adductor magnus.

*137. Lowest serration of external oblique muscle.

NOTES.

*121. This muscle consists of two large masses, which, however, at their origin are closely united together. The muscle-mass lying next to the middle line of trunk is the longissimus dorsi, and that branching from it externally the sacro-lumbalis. The first arises in the hollow between the sacrum and iliac bone, and from the spinous processes of the eight lower vertebræ. A few fasciuli of this muscle are then inserted into the lateral surfaces of the spinous processes of the dorsal vertebræ, those situate more distant from the middle line of the back, to the tips of the transverse processes, and those farthest from the same line to the lower borders of the fourth to the ninth ribs (see the long extending prominence which arises under the latissimus dorsi in Plates IV. and VI., and see Plates of Athlete VII., VIII., X.). The sacro-lumbalis, which constitutes the lower portion of the common erector spinæ, arises from the hindmost portion of the iliac crest, and is

inserted into all the true and rudimentary ribs of the vertebral column up to the fourth cervical vertebra. In the cervical region it becomes an independent muscle, which, however, is not to be seen in the plates, and is called the cervicalis ascendens. In powerfully built individuals the belly of the erector spinæ is to be recognised as an exceedingly strong band above the sacrum, especially near the iliac crests up to the posterior and lower boundary of chest (see Muscle-figures IV., VI., and Athlete VII. Notes and Plates VIII., X.).

*122. The erector spinæ is enclosed in a tendinous sheath, the lumbar fascia; on that account folds appear when the upper part of the body is bent backwards (see Plates IV. and VI. of the Muscle-figure).

*124. See Plates XX. *g*. XXI. *d*, IV., VIII.

*125. See Plate XX. *c*.

*126. See Plate XX. *e*.

*137. See Plates IV., VIII.

PLATE V.

Muscular System of the Athlete.

Anterior aspect.

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| <p>5. Orbicularis palpebrarum muscle.</p> <p>*15. Masseter muscle.</p> <p>17. Hyoid bone.</p> <p>18. Larynx.</p> <p>*19. Sterno-mastoid muscle.</p> <p>*27. Trapezius muscle.</p> <p>*28. Deltoid muscle.</p> <p>*29. Pectoralis major muscle.</p> <p>*30. Costal portion of same.</p> <p>*32. Tendon of same.</p> <p>*33. Biceps muscle.</p> <p>*34. Long head of same.</p> | <p>*36. Tendon of biceps.</p> <p>*37. Coraco-brachialis muscle.</p> <p>*38. Teres major muscle.</p> <p>*39. Triceps muscle.</p> <p>40. Long head of same.</p> <p>*43. Brachialis anticus muscle.</p> <p>*44. Supinator longus muscle.</p> <p>*45. Pronator teres muscle.</p> <p>*46. Extensor carpi radialis longior.</p> <p>*47. Extensor carpi radialis brevior.</p> <p>*53. Annular ligament.</p> <p>*55. Extensor primi internodii pollicis.</p> |
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NOTES.

- *15. Arises by a smaller deep and a larger superficial portion from the zygomatic arch, and is inserted into the external surface of the ramus of the lower jaw.
- *19. Arises by two heads (separated by a cleft) from the manubrium sterni and the clavicle, and is inserted into the mastoid process and into the superior curved line of the occiput. As the two portions approach the mastoid process, they pass over each other and become there united into one muscle. It nods the head and turns the face to the opposite side. In enforced inspiration it raises the chest.
- *27. See Plate IV. 27.
- *28. Arises from the anterior border of the clavicle, the outer border of the acromion process, and the spine of the scapula. It consists of many muscular fasciculi which unite into a strong tendon, and is inserted into a rough prominence on the middle of the outer surface of the humerus. With the arm raised one can recognise the three portions out of which it is formed; the clavicular portion, the acromial portion, and the scapular portion. It raises the arm (see Plates IV., VI., VII.).
- *29. Arises from the sternum, the clavicle and the six upper true rib cartilages; a narrow muscular fasciculus is added from the tendinous expansion of the rectus abdominis. The portion coming from the clavicle is separated from the rest by a groove. It is very powerful; its muscular bundles turn upon themselves as they approach the tendon. Its function is to bring the outstretched arm to the trunk (see Plates III., IV., and Athlete-figure VII., VIII., IX., and Plate XXII. a).
- *30. See Plates III., VII.
- *32. See Plate III.
- *33. Arises by two heads; the long one from the upper end of the articular surface of the scapula; the short, or smaller one, from the coracoid process. It is united with the coraco-brachialis muscle. The two heads form a common muscular belly, which is inserted in the lower part of the tuberosity of the radius. Before the tendon becomes attached it gives off a broad fasciculus, which runs obliquely inwards and downwards to join the fascia.

In the first part of its action it turns the pronated hand outwards and then flexes the fore-arm.

- *34. See Plate XV. b, and the plates of the Athlete.
- *36. See the plate of the scapula, XIII. q, r, and the plate of the arm, XIV.
- *37. Arises from the coracoid process, where it is fused with the biceps muscle, and is inserted into the middle of the upper arm. It draws the arm inward and forward.
- *38. See Plates IV., VI.
- *39. See Plate IV. 39.
- *43. Arises by an outer slip below the point of insertion of the deltoid, from the external surface of the humerus, and by an inner portion from the internal surface of the same bone. It lies directly on the bone, and is covered on its surface by the biceps, so that only its inner and outer edges are visible. It is inserted into the coronoid process of the ulna, forms the floor of the anterior elbow fossa, and bends the arm.
- *44. Arises from the outer and lower border of the humerus, passes down along the radial side of the fore-arm, and is inserted into the styloid process of the radius. It turns the hand outwards (supination), and is one of the chief flexors of the fore-arm. Under it lies the supinator brevis (see Plates III., XIV.).
- *45. Arises from inner condyle of the humerus, and passes obliquely forwards to the radius, in the middle of which it is inserted. It rotates the hand inwards (pronation). (See Plates III., XIV.)
- *46. See plates of arm XIV., XV., XVI., and Muscle-figure IV.
- *47. See plates of arm XIV., XV., XVI., and Muscle-figure IV.
- *53. See Plate XVII.
- *55. Arises with the extensor ossis metacarpi pollicis between the common extensor of the fingers and the two extensors of the carpus, from the middle part of the external surface of the ulna. Its thin tendon is inserted on the dorsal surface of the first phalanx of the thumb (see Plates V., VII., IX.).

PLATE V. MUSCULAR SYSTEM OF THE ATHLETE—*continued.*

- *56. Extensor ossis metacarpi pollicis.
- *58. Palmaris longus muscle.
- *59. Flexor carpi radialis.
- *62. Serratus magnus muscle.
- *63. Rectus abdominis muscle.
- *64. Insertions of rectus muscle.
- *65. Lineæ transversæ.
- *66. Linea alba.
- *68. Poupart's ligament.
- *73. External oblique muscle.
- *77. Tensor vaginæ femoris.
- *78. Ilio-psoas muscle.
- *79. Sartorius muscle.
- *80. Pectineus muscle.
- *81. Adductor longus.
- *82. Gracilis muscle.

- *83. Rectus femoris muscle.
- *85. Vastus externus muscle.
- *86. Vastus internus muscle.
- *87. Tendon of quadriceps.
- 88. Tendon of vastus externus.
- *90. Pad of fat about knee.
- 93. Femoral artery.
- *95. Tibialis anticus muscle.
- *100. Extensor proprius pollicis.
- *101. Tibialis posticus muscle.
- *102. Flexor longus digitorum.
- *104. Gastrocnemius muscle.
- *105. Soleus muscle.
- 106. Tendo Achillis.
- *107. Anterior annular ligament.
- *108. Extensor brevis digitorum.

NOTES.

- *56. Arises like the foregoing, is somewhat stronger, and runs (after it has become tendinous), with the adjacent tendon of the extensor primi internodii, obliquely forwards towards the radial side, and is inserted into the base of the metacarpal bone of the thumb. In very powerful individuals the two muscles appear very strikingly under the skin (see Plates III., VII., IX.).
- *58. Arises from the internal condyle of the humerus by a rather slender muscle-belly, passes then into a thin tendon, which runs across the anterior annular ligament to the tendinous expansion of the palm of the hand, and is inserted there. It assists in bending the hand.
- *59. Arises from the internal condyle of the humerus, passes obliquely downward to the extremity of the radius, and after it has become tendinous it passes through the annular ligament, in order to be inserted into the second metacarpal bone (see Plates III., V., VII., IX.). Under this lies the flexor digitorum sublimis (superficial flexor of the fingers); it arises from the inner condyle of the humerus, from the coronoid process of the ulna, and partly from the radius. Its muscular belly divides itself into four bundles towards its lower third; these then become tendinous, pass through the annular ligament into the palm of the hand, in order to be inserted into the phalanges. Under these lies the flexor digitorum profundus (the deep flexor of the fingers).
- *62. Arises by eight or nine serrations from the lateral surface of the thorax, from the eight or nine upper ribs, which they cover in a fan-like form. Its first and second serrations are inserted into the superior internal angle of the scapula; the third and fourth occupy the entire margin of the same, the remainder converge towards the inferior angle of the scapula. It draws the scapula forward, and retains it close to the chest (see Plates III., IV., and Athlete Plates VII., VIII., IX., and the muscles of the shoulder, Plate XIII. n).
- *63. See Plate XXII. c, and Plates III., V., VII., IX.
- *64. See Plates VII., XXII.
- *65. See Plates V., VII., IX., XXII.
- *66. The linea alba lies between the two recti abdominis muscles, where the two meet together; through this union arises a tendinous thickening, which runs the length of the abdomen as the white line, and is some-

what interrupted by the navel (see plates of Muscle-figure III., V., and the Athlete VII., IX., XXII.).

- *68. It is the lower border of the tendinous expansion of the external oblique muscle (see Plates III., V., XXII.).

- *73. Arises from the external anterior surfaces of the seven or eight lower ribs by a corresponding number of serrations. Its lower four serrations are inserted between those of the latissimus dorsi; its four upper serrations have the same relation to the serrations of the serratus magnus. The posterior muscular bundles are inserted into the outer lip of the crest of the ilium; the others run obliquely forwards to the abdominal wall, and pass into a tendinous expansion which forms Poupart's ligament, and is inserted into the anterior superior iliac spine and the crest of the pubes. At some little distance upwards from the crest of the pubes a triangular slit-like aperture is to be noticed, on the right and left side of the two recti abdominis muscles; this is the external inguinal ring.

This muscle is able, by virtue of the origin of its serrations, to incline the trunk to the side (see plates of Muscle-figure III., IV., V., VI., and those of the Athlete, VII., VIII., IX., X).

- *77. See Plates XX. d, XXI., and Athlete VII., VIII.
- *78. See Plate XX. j.
- *79. See Plates XIX., XX., XXI.
- *80. Arises from the pubic crest, and is inserted into the inner lip of the linea aspera of the femur, below the lesser trochanter (see Plates III., V.).
- *81. See Plate XX. y.
- *82. See Plate XX. e, and Plates III., VII.
- *83. See Plate XX. a, Athlete VII., and Plate XXI.
- *85. See Plates XX. b, and Athlete, Plate VII.
- *86. See Plate XX. z, Plate XXI., and Plates III., VII.
- *87. See Plates XIX., XX., XXI.
- *90. See Plate XX. r, Plates VII. and IX.
- *95. See Plate XX. m, and Athlete VII.
- *100. See Plate XXIV. c.
- *101. See Plates XX. t, and XXIII.
- *102. See Plate XXIII. b.
- *104. See Plate XX. h, plates of Muscle-figure III., IV., V., VI., and Athlete VII., VIII., IX., X.
- *105. See Plates XX. i, III., VII.
- *107. See Plates XX., XXIII.
- *108. See Plate XXIV. e.

PLATE V. MUSCULAR SYSTEM OF THE ATHLETE—*continued*.

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| *112. Flexor carpi ulnaris. | | *130. Pit of stomach. |
| *116. Latissimus dorsi. | | *131. Margin of thorax. |
| *127. Tendon of insertion of same. | | |

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| *112. See Plates IV., VIII. | *130. See Plates III., V., VII., IX. |
| *116. See Plate IV. | *131. See Plates III., V., VII., IX. |
| *127. See Plates IV., V. | |

Since Plates III., VII., and IV., VIII., are drawn from the same aspect as the plates of the skeleton I. and II., we have omitted to make further mention of the skeletal parts which are uncovered by muscles and which are still visible through the skin, as each of these plates, when compared with the corresponding plates of the skeleton, give complete information. However, with regard to the other plates, V., IX., and VI., X., which do not correspond to the plates of the skeleton, the above-mentioned bony parts, as far as they occur on the corresponding plate, were added to the text in order to facilitate their study.

Parts of the Skeleton

which are uncovered by Muscles.

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| 5*. Mastoid process. | 65*. Anterior superior iliac spine. |
| 19*. Clavicle. | 79*. Inner condyle of femur. |
| 20*. Acromion process of scapula. | 80*. Patella. |
| 22*. Manubrium sterni. | 83*. Tibia. |
| 23*. Ensiform cartilage. | 86*. Inner tuberosity of tibia. |
| 30*. Inner condyle of humerus. | 90*. Tubercle of tibia. |
| 42*. Trapezium. | 93*. Inner malleolus. |
| 48*. Seventh rib. | 94*. Anterior border of tibia. |
| 50*. Ninth rib. | 114*. Olecranon. |
| 61*. Sixth rib. | |

PLATE VI.

Muscular System of the Athlete.

Posterior aspect.

- *15. Masseter muscle.
- *19. Sterno-mastoid muscle.
- *27. Trapezius muscle.
- *28. Deltoid muscle.
- *33. Biceps muscle.
- *38. Teres major muscle.
- *40. Long head of triceps muscle.
- *41. Outer head of same.
- *42. Inner head of same.
- *43. Brachialis anticus muscle.
- *44. Supinator longus muscle.
- *45. Pronator teres muscle.
- *46. Extensor carpi radialis longior.
- *48. Extensor carpi ulnaris.
- *49. Anconeus muscle.
- *50. Extensor communis digitorum.
- *52. Tendons of extensors of fingers.
- 53. Annular ligament.
- *73. External oblique muscle.

- *74. Gluteus maximus.
- *75. Gluteus medius.
- 76. Fascia lata.
- *77. Tensor vaginæ femoris.
- 79. Sartorius muscle.
- *82. Gracilis muscle.
- *83. Rectus femoris muscle.
- *85. Vastus externus muscle.
- 88. Tendon of vastus externus.
- *91. Semi-tendinosus muscle.
- *92. Semi-membranosus muscle.
- *94. Short head of biceps femoris.
- *98. Peroneus longus.
- *99. Peroneus brevis.
- *104. Gastrocnemius muscle.
- 106. Tendo Achillis.
- *108. Extensor brevis digitorum.
- *111. Hypothenar eminence.
- *112. Flexor carpi ulnaris.

NOTES.

- *15. See Plate XI.
- *19. See Plate IV. 19.
- *27. See Plate IV.
- *28. See Plate V. 28.
- *33. See Plates IV., V.
- *38. See Plates IV. 38, V., VI., and notes of Plate VII.
- *40. See Plates III., IV. 40, VI., and the plates of the Athlete VII., VIII., X.
- *41. See Plates III., IV. 41, VI.
- *42. See Plates III., IV. 42, V., VI.
- *43. See Plate V. 43.
- *44. See Plate V. 44.
- *45. See Plates V. 45, III., VII., IX., XIV. *w*'.
- *46. See Plates IV. 46, III., VII., IX., XV. 9.
- *48. See Plates IV. 48, VII., VIII., XIV. *m*.
- *49. See Plate IV. 49.
- *50. See Plate IV. 52.
- *52. See Plate IV. 52.

- *73. See Plates IV. 73, III., V., XXII.
- *74. See Plate XX. *f*, Muscle-figure IV., and Athlete VII. VIII., X.
- *75. See Plate XX. *e*.
- *77. See Plate XX. *d*.
- *82. See Plate XX. *r*.
- *83. See Plate XX. *a*, and figure of Athlete VII.
- *85. See Plates XX. *b*, IV., VIII.
- *91. See Plates XX. *q*, III., VII.
- *92. See Plate XX. *w*.
- *94. See Plates XX. *c*', VIII.
- *98. See Plates XX. *k*, VII.
- *99. Lies under the foregoing (see Plate XXI. *g*).
- *104. See Plates XX. *h*, III., VII., VIII., X.
- *108. See Plates XXIII., XXIV. *c*.
- *111. See Plate XVII.
- *112. See Plate IV. 112, and note of Plate VII.

PLATE VI. MUSCULAR SYSTEM OF THE ATHLETE—*continued*.

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| *113. Tendon of triceps. | 120. Infra-spinous fascia. |
| *114. Teres minor. | *121. Longissimus dorsi muscle. |
| *115. Tendon of insertion of deltoid. | *124. Biceps femoris. |
| *116. Latissimus dorsi. | *125. Long head of same. |
| *117. Serration of same. | *126. Adductor magnus |

NOTES.

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| *113. See plate of extended arm, XIV. | *121. See Plate IV. 121, and plates of Muscle-figure IV., VI. |
| *114. See Plate IV. | *124. See Plates XX. <i>g</i> , VII. |
| *115. See Plate V. 28. | *125. See Plate XX. <i>g</i> . |
| *116. See Plate IV. 116, and plates of Athlete VII., VIII., X. | *126. See Plate XX. <i>x</i> . |
| *117. See Plate IV. 116. | |

Parts of the Skeleton

which are uncovered by Muscles.

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| 3*. Occipital bone. | 78*. Outer condyle of femur. |
| 9*. Malar bone. | 80*. Patella. |
| 19*. Clavicle. | 87*. Outer tuberosity of tibia. |
| 20*. Acromion process of scapula. | 88*. Head of fibula. |
| 24*. Inferior angle of scapula. | 92*. Outer malleolus. |
| 30*. Inner condyle of humerus. | 94*. Anterior border of tibia. |
| 35*. Ulna. | 101*. Tuberosity of os calcis. |
| 37*. Lower end or head of ulna. | 114*. Olecranon. |
| 53*. Seventh cervical vertebra; vertebra prominens. | 116*. Spine of scapula. |
| 54*. Twelfth dorsal vertebra. | 117*. Triangle at base of spine of scapula. |
| 61*. Sixth rib. | 118*. First dorsal vertebra. |
| 64*. Crest of ilium. | 119*. Spinous process of first sacral vertebra. |
| 75*. Great trochanter of femur. | 120*. Posterior superior iliac spine. |

PLATE VII.

Figure of the Athlete.

Antero-lateral aspect.

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| <p>*19. Sterno-mastoid muscle.</p> <p>28. Deltoid muscle.</p> <p>29. Pectoralis major muscle.</p> <p>31. Clavicular portion of same.</p> <p>32. Tendon of same.</p> <p>33. Biceps muscle.</p> <p>34. Long head of same.</p> <p>36. Tendon of biceps.</p> <p>37. Coraco-brachialis muscle.</p> <p>39. Triceps muscle.</p> <p>44. Supinator longus muscle.</p> <p>45. Pronator radii teres muscle.</p> <p>46. Extensor carpi radialis longior.</p> <p>47. Extensor carpi radialis brevior.</p> <p>48. Extensor carpi ulnaris.</p> <p>50. Extensor communis digitorum.</p> <p>55. Extensor primi internodii pollicis.</p> <p>56. Extensor ossis metacarpi pollicis.</p> <p>58. Palmaris longus muscle.</p> <p>59. Flexor carpi radialis.</p> <p>64. Insertions of rectus muscle.</p> <p>75. Gluteus medius.</p> <p>77. Tensor vaginae femoris.</p> <p>79. Sartorius muscle.</p> | <p>82. Gracilis muscle.</p> <p>83. Rectus femoris muscle.</p> <p>85. Vastus externus muscle.</p> <p>86. Vastus internus muscle.</p> <p>87. Quadriceps extensor tendon.</p> <p>88. Tendon of vastus externus.</p> <p>90. Pad of fat about knee.</p> <p>91. Semi-tendinosus muscle.</p> <p>95. Tibialis anticus muscle.</p> <p>98. Peroneus longus muscle.</p> <p>101, 102. Tibialis posticus and Flexor longus digitorum muscles.</p> <p>104. Gastrocnemius muscle.</p> <p>105. Soleus muscle.</p> <p>106. Tendo Achillis.</p> <p>108. Extensor brevis digitorum.</p> <p>109. Abductor pollicis.</p> <p>131. Margin of thorax.</p> <p>133. Posterior wall of axilla.</p> <p>*134. Hollow in skin, beneath which lie insertions of radial extensors of carpus.</p> <p>135. Long saphenous vein.</p> <p>136. Basilic vein.</p> |
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- *19. Through the calling into action of these muscles the external jugular vein becomes visible under the skin.
- *134. Under this skin surface lie the long and short extensors

of the hand on the radial side, which are here inserted into the base of the metacarpal bone of the index finger.

NOTE ON

Plates VII., VIII., IX. and X. of the Athlete

(belonging to Plate VII.).

This figure is in exactly the same position as the muscle-figure, covered, however, with skin, and artistically finished. It represents a youthful athlete in the act of raising a heavy ball with his right arm. Although this raising can take place in different ways (according to the relation between the ball and the power used), yet the drawing chosen here will stand in accurate relation to its task.

The ball is already suspended over the head: one more effort, and it will be supported by the extended arm in the line of gravity. The chest is fully expanded and the whole body is thrown into sympathy with it. In consequence of the great weight the upper part of the body is pressed backwards; at the same time, however, the abdominal muscles are thrown into action in order to prevent a further bending back of the trunk, a condition which would entail the overthrow of the Athlete.

The points of insertion of the two recti muscles of the abdomen become visible through the skin below the chest; the surfaces of these muscles become more marked, especially in the neighbourhood of the lineæ transversæ. Through the backward movement the skin undergoes considerable stretching, and one sees even the xiphoid process as well as the cartilaginous portion of the sixth ribs near the sternum. The former and the seventh ribs, which are crossed by the ascending serrations of the rectus abdominis, limit the pit of the stomach (see Muscle-figure, Plates V., IX.).

The left leg is carried backwards, in order to act as a support to the upper part of the body, on which account the extensor muscles are put into action. A further bending back of the upper part of the body is then a little more possible.

The right leg receives some considerable pressure from the weight. The extensors of the same become active and endeavour to further extend the thigh; there arises now a conflict with the flexor muscles, which at the same time have the task of fixing the pelvis in its assumed position. The energetic will stimulates the muscles to a still greater activity in order to perform the task; thus arises a vibration in the entire muscular mechanism, which can be delineated by the artist if the hidden process has been properly appreciated, and if the degree of contraction of the muscles coming into play has been exactly weighed and properly rendered (see plates of the Athlete).

The feet are firmly pressed on the ground, the outer ridge of the articular surface of the astragalus in the extended foot brings pressure to bear upon the fibula. The plantar surface of the foot adapts itself to the ground, in consequence of which the external malleolus is more prominent in this leg than in the other. The two legs must always support correctly the centre of gravity during the oscillations of the weight and the movements of the upper part of the body; for although

the centre of gravity falls into the space between the widely separated feet, and can have a greater scope in this direction, the athlete must feel, nevertheless, the oscillations from side to side. Before the first plan of such an attitude, brought about by muscular exertion, is made, the artist must have settled the point at which the line of gravity must strike the supporting surface; for, according as one intends to represent the attitude at a certain moment, one may consider the same in an advanced stage, in order to give it more appearance of life, as is represented in the two plates of the Athlete. In consequence of this the task becomes a more difficult one, for the position and movements of the joints in the more realistic attitude require an acute perception in order to grasp the *toute ensemble* of the selected momentary period, and to reproduce it correctly, since the duration of inactivity is extremely short for allowing an observation.

If the attitude of the athlete had been so selected that the line of gravity of the weight would so coincide with that of the body that the same were most securely supported, if the ball-lifting arm were more raised and therefore quite extended, then the appearance of vitality would be considerably weakened. A slight expenditure of force would suffice to render the arm rigid. In this position the weight could be held up for a considerable time without much muscular exertion. This is, however, the period of completion of the whole process, for with it the desired task is accomplished. This moment would be the most unfavourable one for the representation of the Athlete that one could select, because the complete elevation of the ball would leave an unsatisfactory effect on the mind of the observer.

Not seldom, however, one sees in artistic representations the moment of an intended action unsuccessfully portrayed. Either it is not the most characteristic one, or the attitude, movement and configuration are blended together from different periods. One gathers from this how absolutely necessary it is, at the beginning of such a work, to have previously determined on the characteristic moment.

The just rendering of such a moment depends solely upon the intellectual representation of the effect of the combined action of the muscular apparatus, in order to find the true forms of the intended moment. Every inch of the Athlete is on that account a physiognomical trait of the entire expression, attitude, and action. By a deep study of the two Athletes one becomes convinced of the indispensable advantages gained by the artist in the study of anatomy.

Upon the lateral surface of the thorax, below the raised arm, one sees the serrations of the serratus magnus muscle (see Plates V., IX.). In consequence of its points of insertion it draws the lower angle of the shoulder-blade forwards; the shoulder-blade rotates on its own axis and becomes fixed

firmly in this position. This must necessarily happen, since most of the muscles which raise the arm arise from the shoulder, and can only thus enter into action. A powerful support is produced by the upper portion of the trapezius and by the serratus magnus. Even with the raised arm unsupported, the serrations of the latter are visible under the skin; when the arm is supporting a heavy weight, they become more marked.

The weight of the ball drags the wrist-joint too far backwards, in consequence of which the carpal bones form a projection on the inner surface of the wrist-joint. The flexor carpi radialis and the palmaris longus muscles endeavour to prevent this; and in striving to produce this effect, the tendons of these muscles appear more distinctly under the skin. The constituent surfaces of the wrist-joint are formed partly by the bony parts of the skeleton, partly by the tendons passing over them.

The task of the arm is to raise itself with the ball, and to change from the previously flexed position into the extended one. One can see through the skin the nearly separate heads of the biceps muscle at their origin, as these combine with the powerful deltoid to elevate the arm. The right pectoralis major muscle becomes, in consequence of this, more flattened, and assists at the same time in fixing the arm in this position. The chief share in extension falls to the triceps muscle. On the posterior surface of the arm one sees the body of the muscle considerably enlarged, its tensely stretched tendon is marked by a hollowed surface; its three heads, with their changing forms and surfaces, produce the charming effect seen on the posterior part of the upper arm.

As the ball is balanced in the region of the long extensor on the radial side, the head of the Athlete is slightly inclined to the side, in case the ball should fall in the direction of his head. It is turned, at the same time, in such a way that the eye can observe both hand and ball; the muscle producing this is the left sterno-cleido-mastoid, and especially the sternal portion. Through its contraction and the tension of the skin the jugular vein became partially visible (see Plate V., Sterno-cleido-mastoid 19, and VII.). The right muscle undergoes some stretching, and, in spite of its passive condition, the sternal tendon appears well marked at the manubrium sterni.

In a similar manner, owing to the tension of the skin, the pomum Adami of the larynx is seen very prominently.

The upper part of the body is laterally inclined, the left arm is dependent at some distance from the body, and is moderately flexed, partly to preserve the balance, and partly as a precaution to come to the aid of the burdened arm, should its strength fail. The greater the expenditure of force the greater will be the tension of the antagonistic muscles; on this account we see their outline well marked on the arm which is ready to assist the other.

During the lateral bending of the trunk one notices the external oblique muscle as a broad flat eminence overlapping the iliac crest. The cartilaginous ends of the seventh, eighth and ninth ribs form the anterior limiting line of the thorax; the three floating ribs are pressed together (see Plates I., II.).

On the right or extended side the skin is very tensely stretched, the three floating ribs are drawn more apart by the action of the obliquus externus muscle, and the tenth rib becomes somewhat visible under the skin. On this side the anterior boundary of the thorax is formed by the seventh, eighth and ninth ribs. The vertebral spinal processes form a well-marked groove on the back, as on the right and left of these same, the two erector spinæ muscles (especially the middle portion or longissimus dorsi) are strongly marked (see Plate IV. 121).

In an upward direction the seventh cervical and the first dorsal vertebrae appear under the skin in an almost oval space. As the bending of the back takes place at the lumbar spine the skin will be somewhat wrinkled there and thrown into folds. This is also the case with the lateral flexion, as noticed upon the posterior surface of the oblique muscle of the abdomen; for in young, well-developed individuals the skin is very elastic and is closely adherent to the muscles. With the arm elevated one sees on this surface of the back the deltoid muscle strongly put into action; its three portions become markedly prominent—the middle one, which arises from the acromion process, is especially active here. The trapezius muscle, which lies superiorly, and which is partly

inserted into the clavicle, becomes thicker as it slightly raises the shoulder. The portion arising from the vertebrae is inserted into the spine of the scapula; and through the contraction of the lower portion—*i.e.*, the portion arising from the spinal processes of the lowest thoracic vertebrae—the scapula is rotated outwards. The effect of this portion on the triangular surface at the base of the scapular spine is rather noteworthy (see Plate VIII.).

The swelling above the spine of the shoulder-blade is due to the action of the underlying supra-spinatus muscle; it aids in raising the arm and rotating it outwards; in the latter action it is assisted by the infra-spinatus and teres minor, which here together form a prominence. Through the action of these three muscles the triangular surface at the end of the spine of the scapula appears now as a slight hollow. The shoulder-blade on this side is more flattened, whilst that of the left appears more prominent. It is firmly held in its assumed position by the surrounding muscles, and lies somewhat nearer to the dorsal line; the greater and lesser rhomboid muscles are shortened, hence the prominence on the posterior margin of the shoulder-blade.

The lower angle of each shoulder-blade, together with the teres major muscle, are covered by the latissimus dorsi, more so when the arm is raised than when it is dependent. Through the stretching of this muscle, and of the skin over it, one sees very slightly beneath the integument its fleshy serrations, which arise from the ribs, and between which the serrations of the oblique muscle of the abdomen are inserted. One sees likewise some ribs, especially the sixth, in the neighbourhood of the lower angle of the shoulder-blade. One can also follow up the limiting line of the serratus magnus from its last serration to this angle. The surfaces and depressions which here become visible require much attention in their representation.

The two powerful glutei maximi muscles are here very different in their form, the muscle of the leg standing back not being so tense as that of the forward leg; however, their line of origin from the iliac crest and the sacrum is well marked. They both fix the pelvis at the hip joint, in which action they are aided by the glutei medii muscles. As the extended leg at the same time points outwards, the greater trochanter approaches the crest of the ilium; the gluteus medius, which co-operates in producing this effect, is on that account contracted and very prominent. The gluteus maximus of the extended leg is inserted rather sharply into the upper thigh, and forms a broad skin fold, which runs towards the cleft between the nates. The gluteus maximus of the flexed leg is, however, on the whole more flattened; it also has to exert a far greater force in order to fix the upper thigh, as the load affects chiefly this limb. Its muscle bundles become, therefore, slightly visible under the skin, especially in the neighbourhood of the great trochanter; and towards the terminal tendon these bundles form depressions on the surface. Both muscles are firmly knit together; hence arises a characteristic hollowing above the coccyx when this bends inwards. In both muscles the type of power is manifest (see Plates VIII., X.).

The skin is adherent to the posterior superior spinous process, and in consequence of the swelling of the surrounding muscles it becomes prominent. Thus the dimples over the iliac spines are explained. The tensor of the fascia of the thigh, on account of its origin and point of insertion, contributes likewise to the fixing of the pelvis, and drags so strongly on the fascia lata that the vastus externus has the appearance of being divided (see Plates XX. and XXI.). The outline of the superior external part of this muscle is due to this, and thus there arises a broad concave surface on the outer side of the upper part of the thigh. One sees on the same side towards the knee-joint the fleshy insertion of the muscle appearing very marked. The biceps femoris muscle is active, and the tendon of its long head is markedly visible under the stretched skin as far as the head of the fibula into which it is inserted (see Plate XX.). Its short head sinks back and causes an elongated furrow. The external condyle of the femur, as well as the tensely stretched extensor tendon under which the patella lies, are very easily recognised (see Plate XXI.). The popliteal space appears deeper on the inner side of the thigh than on the outer; for, as the muscles of the inner side are inserted lower down in the limb,

NOTE ON PLATES VII., VIII., IX. AND X.—*continued.*

the inner border becomes higher through the tension of these muscles. The gastrocnemius, on the one hand, through its double-headed origin, fixes the knee in a certain stated angle of flexion, and on the other hand presses the foot to the ground by means of the tendo Achillis in combination with the soleus, peroneus brevis and abductor minimi digiti (see plate of Muscle-figure and Plate XX.).

Its heads of origin, of which the inner is somewhat the longer and thicker, are very prominent; the tendinous expansions over these heads form broad surfaces which, in the neighbourhood of their insertion into the tendo Achillis, become somewhat concave through the prominence of the muscle-belly (see plate of Athlete). The calf is considerably thickened; the peroneus longus and peroneus brevis form an elongated swelling; the tendon of the former is seen already above the external malleolus, whilst that of the latter appears below the same next to the peroneus longus under the skin. As the whole body presses forward against the weight, the leg of the bent limb is inclined somewhat towards the dorsum of the foot. The consequence is that the extensor communis digitorum and the tibialis anticus muscle become visible above the ankle-joint.

The foot is firmly pressed to the ground, the muscles on the outer and inner margins of the foot are very marked. The base of the fifth metatarsal bone becomes, in consequence of this pressure, more distinct, and the bellies of the surrounding muscles are thickened. The heel, when viewed from behind, forms a somewhat ball-shaped swelling, flattened towards the ground; in the region of the insertion of the tendo Achillis the angular surfaces of the os calcis are seen.

On the posterior surface of the extended leg, below the gluteus muscle, towards the inner side of the thigh, some small fossæ become visible; they permit the action of the underlying muscles to be seen; the hollow lying close below the nates is produced by the action of the adductor magnus.

Towards the popliteal space one sees likewise faintly hollowed surfaces which are due to the fleshy insertion of the underlying muscles (see Plates IV., VI., VIII.).

The tendon of the semi-tendinosus muscle becomes visible only for one moment; as the weight of the ball, whilst seeking for the centre of gravity (if the same tends to preponderate backwards), will flex somewhat the leg at the knee-joint, so also here the flexor and extensor muscles enter into antagonism with each other. The leg is therefore not yet fully extended, although nearly so; and, according as the oscillations of the weight are forwards or backwards, it will appear alternately more flexed or more extended. It is very difficult to represent

the action which thus arises in the leg, for in order to delineate characteristically a similar movement, a thorough understanding of the muscular apparatus and its action is absolutely necessary, as already has been stated.

The appearance in the region of the two knee-joints is very different: whilst in the flexed leg the short head of the biceps muscle is sunk back, it is pressed forward in the extended leg, whereby a longish swelling appears on the outer side of the same.

The common tendon of the quadriceps extensor, which runs in front of the outer condyle of the femur, and which is more sharply defined (below the insertion of the vastus externus muscle) towards the anterior surface of the thigh, than towards the posterior, is very prominent. Beyond the posterior surface of the two condyles of the femur the muscles of the popliteal space are made to project.

The prominence of the upper margin of the patella of the extended leg is due to the curvature of the femur above the articular surface. It disappears in flexion.

The calf muscle is thickened also in the extended leg. The thigh is somewhat rotated inwards in order to obtain a more advantageous line of traction for the muscles, while the foot is placed upon the ground. As the foot is here chiefly pressed to the floor along the inner margin of the sole and the ball of the great toe, so one sees here already, a few fingers' breadth above the external malleolus, the tendon of the peroneus longus muscle markedly prominent; below the same malleolus one sees this combined with the tendon of the short peroneus, which is placed anteriorly. The foot is inclined inwards, whereby the dorsum comes to be in the nearer relation with the leg—*i.e.*, the angle which the backwards-placed leg makes with the foot becomes more acute in consequence of the internal rotation of the same; thus the tibialis anticus and the extensor communis digitorum are very prominent. The former is thickened towards its place of origin; in the neighbourhood of the tibial spine it becomes more marked, and the tendon already becomes partly visible where it leaves its muscle. As can be seen by its point of insertion, it raises the inner margin of the foot: the oblique inclination of the leg to its supporting surface is conducive to this action, and in consequence of this the outer margin of the foot becomes more firmly placed on the floor. Through the forcing downwards of the internal margin of the sole, the osseous framework of the foot is drawn towards the abductor hallucis, whereby its upper limit becomes very marked under the skin. Several dimples arise in consequence of this in the neighbourhood of its origin, as well as in its upper part.

PLATE VIII.

Figure of the Athlete.

Postero-lateral aspect.

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| 27. Trapezius muscle. | 87. Tendon of quadriceps. |
| 28. Deltoid muscle. | 88. Tendon of vastus externus. |
| 33. Biceps muscle. | 91. Semi-tendinosus muscle. |
| 38. Teres major muscle. | 92. Semi-membranosus muscle. |
| 39. Triceps muscle. | 94. Short head of biceps femoris. |
| 40. Long head of same. | 95. Tibialis anticus muscle. |
| 43. Brachialis anticus muscle. | 98. Peroneus longus muscle. |
| 44. Supinator longus muscle. | 99. Peroneus brevis muscle. |
| 45. Pronator radii teres muscle. | 104. Gastrocnemius muscle. |
| 46. Extensor carpi radialis longior muscle. | 105. Soleus muscle. |
| 48. Extensor carpi ulnaris muscle. | 106. Tendo Achillis. |
| 49. Anconeus muscle. | 112. Flexor carpi ulnaris muscle. |
| 52. Tendons of extensors of fingers. | 113. Tendon of triceps. |
| 59. Flexor carpi radialis muscle. | 115. Tendon of insertion of deltoid. |
| 62. Serratus magnus muscle. | 116. Latissimus dorsi muscle. |
| 73. External oblique muscle. | 117. Serration of same. |
| 74. Gluteus maximus muscle. | 119. Infra-spinatus muscle. |
| 75. Gluteus medius muscle. | 121. Longissimus dorsi muscle. |
| 77. Tensor vaginæ femoris muscle. | 124. Biceps femoris. |
| 79. Sartorius muscle. | 125. Long head of same. |
| 82. Gracilis muscle. | 126. Adductor magnus muscle. |
| 83. Rectus femoris muscle. | 137. Lowest serration of external oblique |
| 85. Vastus externus muscle. | muscle. |
| 86. Vastus internus muscle. | |

PLATE IX.

Figure of the Athlete.

Anterior aspect.

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| 19. Sterno-mastoid muscle. | 73. External oblique muscle. |
| 20. Sternal and clavicular portions of sterno-mastoid muscle. | 75. Gluteus medius. |
| 27. Trapezius muscle. | 77. Tensor vaginæ femoris. |
| 31. Clavicular portion of pectoralis major. | 79. Sartorius muscle. |
| 32. Tendon of insertion of pectoralis major. | 81. Adductor longus. |
| 33. Biceps muscle. | 82. Gracilis muscle. |
| 34. Long head of same. | 83. Rectus femoris muscle. |
| 36. Tendon of biceps. | 86. Vastus internus muscle. |
| 37. Coraco-brachialis muscle. | 87. Tendon of the quadriceps extensor muscle. |
| 38. Teres major muscle. | 90. Pad of fat about knee. |
| 43. Brachialis anticus muscle. | 95. Tibialis anticus muscle. |
| 44. Supinator longus muscle. | 96. Extensor communis digitorum. |
| 45. Pronator radii teres muscle. | 101, 102. Tibialis posticus and flexor longus digitorum muscles. |
| 47. Extensor carpi radialis brevior. | 104. Gastrocnemius muscle. |
| 55. Extensor primi internodii pollicis. | 105. Soleus muscle. |
| 56. Extensor ossis metacarpi pollicis. | 106. Tendo Achillis. |
| 58. Palmaris longus muscle. | 109. Abductor pollicis. |
| 59. Flexor carpi radialis. | 112. Flexor carpi ulnaris. |
| 62. Serratus magnus muscle. | 116. Latissimus dorsi muscle. |
| 63. Rectus abdominis muscle. | 130. Pit of stomach. |
| 64. Insertions of rectus muscle. | |
| 66. Linea alba. | |
-

Parts of the Skeleton

which are uncovered by muscles, and are visible through the skin.

-
- | | |
|-------------------------------------|---------------------------------|
| 19*. Clavicle. | 79*. Inner condyle of femur. |
| 22*. Manubrium sterni. | 80*. Patella. |
| 30*. Inner condyle of humerus. | 83*. Tibia. |
| 40*. Styloid process of radius. | 86*. Inner tuberosity of tibia. |
| 48*. Seventh rib. | 90*. Tubercle of tibia. |
| 61*. Sixth rib. | 93*. Inner malleolus. |
| 64*. Crest of ilium. | 114*. Olecranon. |
| 65*. Anterior superior iliac spine. | 131*. Lower margin of thorax. |

PLATE X.

Figure of the Athlete.

Posterior aspect.

-
- | | |
|---|---|
| 19. Sterno-mastoid muscle. | 85. Vastus externus muscle. |
| 27. Trapezius muscle. | 87. Tendon of quadriceps extensor muscle. |
| 28. Deltoid muscle. | 88. Tendon of vastus externus. |
| 33. Biceps muscle. | 91. Semi-tendinosus muscle. |
| 38. Teres major muscle. | 92. Semi-membranosus muscle. |
| 39. Triceps muscle. | 94. Short head of biceps femoris. |
| 41. Outer head of same. | 98. Peroneus longus. |
| 43. Brachialis anticus muscle. | 99. Peroneus brevis. |
| 44. Supinator longus muscle. | 104. Gastrocnemius muscle. |
| 48. Extensor carpi ulnaris. | 105. Soleus muscle. |
| 49. Anconeus muscle. | 106. Tendo Achillis. |
| 50. Extensor communis digitorum. | 108. Extensor brevis digitorum. |
| 55. Extensor primi internodii pollicis. | 112. Flexor carpi ulnaris. |
| 56. Extensor ossis metacarpi pollicis. | 113. Tendon of triceps. |
| 73. External oblique muscle. | 115. Tendon of insertion of deltoid. |
| 74. Gluteus maximus. | 116. Latissimus dorsi. |
| 75. Gluteus medius. | 117. Serration of same. |
| 77. Tensor vaginæ femoris. | 118. Rhomboideus muscle. |
| 79. Sartorius muscle. | 121. Longissimus dorsi. |
| 82. Gracilis muscle. | 125. Long head of biceps femoris. |
| 83. Rectus femoris muscle. | 126. Adductor magnus. |
-

Parts of the Skeleton

which are uncovered by muscles and are visible through the skin.

-
- | | |
|---|--|
| 20*. Acromion process of scapula. | 87*. Outer tuberosity of tibia. |
| 30*. Inner condyle of humerus. | 88*. Head of fibula. |
| 37*. Lower end or head of ulna. | 90*. Tubercle of tibia. |
| 53*. Seventh cervical vertebra; vertebra prominens. | 92*. Outer malleolus. |
| 54*. Twelfth dorsal vertebra. | 94*. Anterior border of tibia. |
| 61*. Sixth rib. | 114*. Olecranon. |
| 64*. Crest of ilium. | 117*. Triangular surface at end of spine of scapula. |
| 75*. Great trochanter. | 118*. First dorsal vertebra. |
| 78*. Outer condyle of femur. | 120*. Posterior superior iliac spine. |
| 80*. Patella. | |

PLATE XI.

A. The Skull.

- | | |
|--|---|
| <ul style="list-style-type: none"> *1. Frontal bone. 2. Parietal bone. *3. Occipital bone. 4. Occipital protuberance. 5. Mastoid process. *6. Angle of lower jaw. *7. Median part of lower jaw, symphysis. *8. Superciliary ridge. *9. Nasal process. | <ul style="list-style-type: none"> *10. External auditory meatus. 11. Zygomatic process of temporal bone. *12. Malar bone. *13. Nasal bone. *14. Temporal bone. 15. Body of lower jaw. *16. Upper jaw. *17. Hyoid bone. *18. Ascending ramus of lower jaw. |
|--|---|

NOTES.

- *1. The two eminences on the anterior surface of the frontal bone are the frontal tuberosities.
- *3. If the lower surface of the occipital bone be touched by a line drawn from it to the nasal spine, a proper relation is obtained between the occiput and the face.
- *6. One finds, even with the most slightly built feminine skulls, the outline of the lower jaw well marked. In heads of modern Madonnas one perceives frequently an endeavour, in order to escape the reproach of harshness, to change these well-marked outlines in an affected manner into a rounded oval, even at the expense of truth to nature.
- *7. On the lower margin of this surface one sees *en face* two small prominences (mental tubercles), whereby the boundary of the lateral surfaces is more marked than at the dental margin. By means of a triangular prominence (mental protuberance) this surface is divided into two fossæ.
- *8. Through the arching of these being pronounced, the frontal bone acquires the powerful expression which one finds so frequently in deep thinkers.
- *9. An angle drawn from the chin to the tip of the nose, and from thence to the forehead, is of great importance, especially for the portrait.
- *10. With the mouth closed the external auditory meatus is somewhat narrowed by the condyle of the lower jaw, on which account a person listening intently opens the

- mouth, whereby the condyle is somewhat pushed forward in order to dilate the auditory meatus, so that a greater number of sound-waves may strike the drum of the ear. If one puts the little finger into the opening of the external ear, one can feel this phenomenon well during the opening and closing of the mouth.
- *12. The cheek surface of the malar bone is a very characteristic portion of the face. In the plastic portrait the osseous framework of the skull is of much importance; in this alone lies the greatest character.
- *13. The two nasal bones form together the bridge of the nose.
- *14. Between the roots of the temporal process lies the glenoid fossa.
- *16. In old age both jaws suffer a considerable change in outline, the lower jaw especially becoming smaller and wasted. If the teeth are wanting, the anterior surfaces of both jaws fall in towards the mouth. How strikingly old age is illustrated through this can be seen in the skull. Such points cannot therefore be overlooked in the depicting of older heads.
- *17. See the skull *en face* for the muscles.
- *18. On the upper part of this ramus two processes are separated by a crescentic notch; the anterior is called the coronoid, the posterior the condyloid process. The anterior border of the coronoid process passes below into the external oblique line of the body of the jaw.

PLATE XI.

B. Muscles of the Head and Face.

- | | |
|---|---|
| * <i>a.</i> Frontalis muscle. | <i>k.</i> Depressor anguli oris. |
| <i>b.</i> Orbicularis palpebrarum muscle. | <i>l.</i> Depressor labii inferioris. |
| <i>c.</i> Levator labii superioris et alæ nasi. | * <i>m.</i> Sterno-cleido-mastoid muscle. |
| <i>d.</i> Compressor nasi. | <i>n.</i> Levator scapulæ. |
| * <i>e.</i> Alar cartilage of nose. | <i>o.</i> Trapezius muscle. |
| <i>f.</i> Temporal muscle. | <i>p.</i> Digastric muscle. |
| * <i>g.</i> Zygomaticus major muscle. | <i>q.</i> Buccinator muscle. |
| <i>h.</i> Orbicularis oris muscle. | <i>r.</i> Scalp. |
| * <i>i.</i> Masseter muscle. | |

NOTES.

- | | |
|---|--|
| * <i>a.</i> A small muscle, the corrugator supercilii, is covered by the frontalis and the orbicularis palpebrarum muscles. | * <i>i.</i> The masseter consists of two portions, an anterior and posterior; the anterior portion draws the lower jaw forwards, as well as upwards. |
| * <i>c.</i> In well-shaped noses, the alar cartilages form marked surfaces. | * <i>m.</i> Sternal portion of the sterno-cleido-mastoid (see Table III., 19). |
| * <i>g.</i> Above this lies the zygomaticus minor muscle. | |

PLATE XII.

Shoulder-blade and Clavicle.

Superior and lateral aspect.

- | | |
|---|---|
| *2. Acromion process. | 12. Vertebral border of scapula. |
| *3. Clavicle. | 13. Infra-glenoid tubercle. |
| *4. Triangle at base of spine of scapula. | *14. Anterior surface of scapula. |
| 5. Superior angle of scapula. | 15. Axillary border of scapula. |
| *6. Inferior angle of scapula. | 16. Surface of origin of teres major and minor. |
| *7. Coracoid process. | 17. Posterior surface of scapula. |
| *8. Greater tuberosity of humerus. | 18. Infra-spinous fossa. |
| *9. Lesser tuberosity of humerus. | 19. Supra-spinous fossa. |
| *10. Spine of scapula. | 20. Articular surface of clavicle. |
| 11. Glenoid fossa. | |

NOTES.

The shoulder-blade is a flat, broad, partially translucent bone; it lies on the posterior wall of the thorax, and reaches from the second to the seventh or eighth rib.

- *2. Is a very important process, which serves as a guiding point to a proper representation of the movements of the upper part of the body, as well as of the raised arm.
- *3. The shoulder-blade and the clavicle of both sides form the shoulder girdle; the latter forms, with the manubrium sterni, the sterno-clavicular joint. In order to give the necessary freedom of action to the arm, the shoulder-blade is capable of being moved by means of the clavicle from the lateral surface of the thorax.
- *4. Appears through the surrounding muscles as a flat, hollowed, triangular space (see Plate XIII., Note IV.,

and the plates of Muscle-figure IV. and VI., as well as plates of Athlete VIII., X.).

- *6. Has to be attentively marked when the shoulder-blade is moved, as it becomes very prominent in the body-outline (see note of figure of Athlete, VII.).
- *7. Here the coraco-brachialis muscle arises, together with the short head of the biceps.
- *8. In the pendent arm this lies in front and to the outer side.
- *9. Lies in front and to the inner side.
- *10. The spine of the shoulder-blade is a prominent osseous crest, and divides the scapula into two flat fossæ, the supra- and infra-spinous fossæ.
- *14. Is somewhat hollowed and marked with rough elevated lines, the points of origin of the sub-scapularis muscle.

PLATE XIII.

A. Bones of the Shoulder.

- | | |
|---|------------------------------------|
| *1. Head of the humerus. | *6. Inferior angle of scapula. |
| *2. Acromion process. | *7. Coracoid process. |
| *3. Clavicle. | *8. Greater tuberosity of humerus. |
| *4. Triangle at base of spine of scapula. | *9. Lesser tuberosity of humerus. |
| *5. Superior angle of scapula. | |

NOTES.

- *1. The capsular ligament is cut through in fig. 2.
*2. It is of great importance to the artist, in order to produce the true proportions of a figure, to have impressed upon his mind such points of the skeleton.
*3. See Plate XII.
*4. A triangular space, through which the axis of the shoulder-blade passes. If the scapula be rotated inwards or outwards, the movement occurs around this axis. It

- lies loosely embedded among the muscles, and is movable more or less in all directions.
*5. See Plate XII.
*6. See Plate XII.
*7. See Plate XII.
*8. Serves as a point of insertion for the external rotator muscles (*f, k, l*).
*9. A point of insertion for the internal rotator muscles (*g, o*).

PLATE XIII.

B. Muscles of the Shoulder.

- **a.* Trapezius muscle.
- **b.* Rhomboideus minor muscle.
- c.* Rhomboideus major muscle.
- **d.* Latissimus dorsi muscle.
- **e.* Deltoid muscle.
- **f.* Infra-spinatus muscle.
- **g.* Teres major muscle.
- g'.* Tendon of same.
- **h.* Tendon of trapezius muscle.
- i.* Outer head of triceps.
- i'.* Long head of triceps.
- k.* Supra-spinatus muscle.
- **l.* Teres minor muscle.
- m.* Capsular ligament (cut through).

- **n.* Serratus magnus muscle.
- **o.* Subscapularis muscle.
- p.* Tendon of latissimus dorsi muscle.
- **q.* Tendon of long head of biceps muscle.
- **r.* Tendon of short head.
- **s.* Coraco-brachialis muscle.
- **t.* Sterno-cleido-mastoid muscle.
- u.* Pectoralis major muscle.
- u'.* Tendon of same.
- w.* Biceps muscle.
- **y.* Serration of external oblique muscle of abdomen.
- **z.* Muscular slip of pectoralis major.

NOTES.

- **a.* Is partly cut off.
- **b.* Very often the two muscles are united. Sometimes, however, the portion arising from the cervical vertebrae and that arising from the thoracic vertebrae are separated by a cleft; the former is the greater, the latter the smaller, rhomboid muscle.
- **d.* Covers over the inferior angle of the scapula, and also partially the teres major, forming with this latter the posterior wall of the axilla. Is cut off in fig. 4, before its insertion and the formation of its terminal tendon (see Plate IV.).
- **e.* It consists of numerous muscular bundles, three considerable masses of which are very characteristically prominent when the arm is raised (see the plates of the Athlete). It covers the head of the humerus, the ball-shaped form of which can be distinctly recognised in thin persons.
- **f.* It is partly covered by the scapular origin of the deltoid and by a tendinous fascia (Fascia infra-spinata). In fig. 2 of this plate it is entirely removed, with the exception of a few portions.
- **g.* See fig. 2 of this plate.
- **h.* Serves as a point of insertion for the muscle bundles

- coming from the lower vertebrae; if these act, they rotate the lower angle of the scapula outwards (see Plate V.).
- **l.* With the arm pendulous the infra-spinatus and the teres minor form a continuous surface.
- **n.* In consequence of its lower points of insertion into the scapula, it can draw the lower angle of that bone forwards. To effect this fixation of the ribs, a deep inspiration is necessary (see Plate I. 22, and the other plates of the Athlete).
- **o.* Is not to be seen in the living model as long as the arm and shoulder-blade remain close to the thorax. It occupies the concave surface of the shoulder-blade, and lies between this and the thorax.
- **q.* Runs in the groove between the two tuberosities of the head of the humerus.
- **r.* Is joined at its origin to the coraco-brachialis muscle; both come from the coracoid process.
- **s.* See fig. 2 of this Plate.
- **t.* See Plate IV. 19.
- **y.* See Plate III. 73, and Plates IV., V., VI.
- **z.* See Plates III., V.

PLATE XIV.

A. Bones of the Upper Limb (in extension).

- | | |
|--|--|
| *1. Spine of scapula. | 18. Scaphoid bone. |
| 2. Lesser tuberosity of head of humerus. | *19. Metacarpal bones. |
| 3. External condyle of humerus. | 20. Trapezium. |
| 4. Internal condyle of humerus. | 21. First phalanges of fingers. |
| 5. Head of radius. | 22. Second phalanges of fingers. |
| *6. Olecranon fossa. | 23. Terminal phalanges of fingers. |
| 7. Olecranon. | 24. Clavicle. |
| *8. Ulna. | *25. Posterior surface of ulna. |
| 9. Head of ulna. | 26. Coracoid process. |
| *10. Unciform bone. | 27. Greater tuberosity of head of humerus. |
| 11. Metacarpal bone of thumb. | 28. Trochlear surface of humerus. |
| 12. Terminal phalanx of thumb. | *29. Tubercle of radius. |
| 13. First phalanx of thumb. | *30. Infra-glenoid tubercle. |
| 14. Humerus. | 31. Fossa for coronoid process of ulna. |
| 15. Glenoid cavity of scapula. | *32. Coronoid process of ulna. |
| 16. Inferior angle of scapula. | *33. Pisiform bone. |
| *17. Styloid process of radius. | |

NOTES.

- | | |
|---|--|
| *1. See Plate XII. | *29. Point of insertion of the biceps muscle. In consequence of its mode of insert on, it must, during the first stage of flexion, supinate the inwardly rotated or pronated fore-arm. |
| *6. In the highest degree of extension the olecranon is pressed into this fossa, so that it is impossible to extend it further. | *30. From this tubercle arises the long head of the triceps muscle. |
| *8. See Plate IV. | *32. See Plates XIV., XV. |
| *10. See Plate XVII. | *33. See Plate XVII. |
| *17. See Plate XVII. 11. | |
| *19. See Plate XVII. 2. | |
| *25. This portion of the ulna is free from muscular attachments (see Plate XVI. 32). | |

PLATE XIV.

B. Muscles of the Upper Limb (in extension).

- | | |
|---|--|
| * <i>a</i> . Deltoid muscle. | <i>m'</i> . Tendon of same. |
| * <i>b</i> . Triceps muscle. | <i>n</i> . Extensor carpi radialis brevior. |
| <i>b'</i> . Tendon of same. | <i>o</i> . Extensor primi internodii pollicis. |
| <i>b''</i> . Inner head of same. | <i>o'</i> . Extensor ossis metacarpi pollicis. |
| <i>b'''</i> . Tendinous covering over muscular belly. | <i>p</i> . Hypothenar eminence. |
| <i>c</i> . Brachialis anticus muscle. | * <i>q</i> . Infra-spinatus muscle. |
| <i>d</i> . Supinator longus muscle. | * <i>r</i> . Teres minor muscle. |
| <i>d'</i> . Tendon of same. | * <i>s</i> . Teres major muscle. |
| * <i>e</i> . Extensor carpi radialis longior. | <i>t</i> . Latissimus dorsi muscle. |
| <i>e'</i> . Tendon of same. | <i>u</i> . Tendons of flexor muscles of fingers. |
| * <i>f</i> . Anconeus muscle. | * <i>v</i> . Biceps muscle. |
| <i>g</i> . Flexor carpi radialis. | <i>v'</i> . Long head of same. |
| <i>h</i> . Flexor carpi ulnaris. | <i>v''</i> . Short head of same. |
| <i>h'</i> . Tendon of same. | * <i>v'''</i> . Deep tendon of same. |
| <i>i</i> . Thenar eminence. | * <i>w</i> . Pronator teres muscle. |
| * <i>j</i> . Pectoralis major muscle. | * <i>x</i> . Extensor communis digitorum. |
| <i>j'</i> . Tendon of same. | <i>y</i> . Abductor pollicis muscle. |
| <i>k</i> . Tendon of long flexor of thumb. | <i>z</i> . Coraco-brachialis muscle. |
| <i>l</i> . Adductor pollicis. | <i>z'</i> . Flexor longus pollicis. |
| <i>m</i> . Extensor carpi ulnaris. | |

NOTES.

- | | |
|---|---|
| * <i>a</i> . See Plate XIII. <i>e</i> . | * <i>r</i> . The teres minor and major muscles are somewhat separate from each other, in order to allow passage of the long head of the triceps which arises from the infra-glenoid tubercle (see Plates IV., VI.). |
| * <i>b</i> . With the arm extended, and especially with great muscular exertion, one sees, on the posterior surface of the arm, its fleshy mass in strong relief (see the plates of the Athlete). The tendon produces an elongated hollow surface. If the arm on the other hand be flexed, the marked insertions of the body of the muscle disappear in consequence of the tension which they suffer (see Plate XV.). | * <i>s</i> . The teres major is partially covered by the latissimus dorsi (see Plate XIII.). |
| * <i>c</i> . With the hand over extended (the dorsum upwards) the two extensors (of the wrist) are to be felt through the skin under the flexion folds of the wrist. | * <i>t</i> . See the surfaces of same. |
| * <i>f</i> . The anconeus appears as the fourth head of the triceps. | * <i>v'''</i> . From this tendon there passes a broad fasciculus obliquely inwards and downwards into the fascia of the fore-arm. If the biceps is in activity, this fascia is seen well marked. |
| * <i>j</i> . See Plate XXII. <i>a</i> . | * <i>w</i> . A clear understanding of the many movements of the fore-arm and its variations in form is only possible if the mechanical laws of this are rightly grasped. |
| * <i>q</i> . See Plate XIII. <i>f</i> . | * <i>x</i> . See Plate XVII. <i>s</i> . |

PLATE XV.

A. Bones of the Flexed Arm.

Lateral aspect.

- | | |
|--|--------------------------------------|
| *1. Olecranon. | 15. Humerus. |
| *2. External condyle of humerus. | 16. Greater tuberosity of humerus. |
| 3. Head of radius. | 17. Base of scapula. |
| 4. Clavicle. | 18. Head of ulna. |
| *5. Spine of scapula. | 19. Ulna. |
| *6. Triangular surface at end of spine of scapula. | 20. Tubercle of radius. |
| *7. Metacarpal bone of thumb. | 21. Neck of humerus. |
| *8. Styloid process of radius. | 24. Pisiform bone. |
| 9. Unciform bone. | *25. Internal condyle of humerus. |
| 10. Second metacarpal bone. | *26. Head of humerus. |
| *11. Scaphoid bone. | *27. Coracoid process. |
| 12. Inferior angle of scapula. | *28. Lesser tuberosity of humerus. |
| 13. Superior angle of scapula. | *29. Coronoid process. |
| *14. Infra-glenoid tubercle. | 31. Trochlear surface of humerus. |
| | *32. Posterior surface of olecranon. |

NOTES.

- | | |
|--|---|
| *1. In the pendulous arm, a line drawn from this point, horizontally, touches the internal condyle. | it, but loses itself quicker than that on the outer side, in the humerus. The small surface upon the internal condyle and a portion of the ridge remain free from muscular attachments. |
| *2. Serves as a point of origin for the extensor muscles. From this point there runs a sharp ridge, gradually losing itself in the shaft of the humerus. | *26. Forms a ball-and-socket joint, lined by cartilage. |
| *5. Lies directly under the skin. | *27. See Plate XII. |
| *6. See Plate XIII. 4. | *28. From each of these tuberosities runs a ridge downwards. Both are lost on the shaft of the humerus. That of the greater tuberosity is the longer. |
| *7. See Plate XVII. 1. | *29. Has entered into the fossa intended for it; a very slight further flexion, and its extreme position will be attained. |
| *8. See Plate XVII. 11. | *32. See Plate XVI. |
| *11. See Plate XVII. 8. | |
| *14. See Plate XII. | |
| *25. Is larger than the external condyle, and serves as a point of origin for the flexors. A sharp ridge arises also from | |

PLATE XV.

B. Muscles of the Flexed Arm.

Lateral aspect.

- | | |
|--|---|
| * <i>a.</i> Deltoid muscle. | <i>m.</i> Flexor longus pollicis. |
| <i>a'.</i> Tendon of pectoralis major. | <i>n.</i> Supinator longus muscle. |
| * <i>b.</i> Biceps muscle. | <i>o.</i> Extensor carpi radialis brevior. |
| <i>b'.</i> Tendinous sheath of biceps. | <i>p.</i> Extensor communis digitorum. |
| * <i>c.</i> Brachialis anticus. | <i>q.</i> Extensor carpi radialis longior. |
| * <i>d.</i> Triceps muscle. | <i>r.</i> Palmaris longus muscle. |
| <i>e.</i> Teres major. | <i>s.</i> Extensor primi internodii pollicis. |
| * <i>f.</i> Latissimus dorsi. | <i>t.</i> Abductor pollicis. |
| * <i>g.</i> Infra-spinatus muscle. | <i>u.</i> Anconeus muscle. |
| <i>h.</i> Infra-spinatus fascia. | <i>w.</i> Extensor carpi ulnaris. |
| <i>i.</i> Trapezius muscle. | <i>x.</i> Flexor carpi ulnaris. |
| <i>k.</i> First interosseous muscle or abductor indicis. | <i>y.</i> Flexor carpi radialis. |
| <i>l.</i> Extensor tendon of index finger. | * <i>z.</i> Pronator radii teres. |

NOTES.

**a* See the plates of the Athlete.

**b.* See Plates III., XIV. The surfaces of this muscle are due to the offshoots of its tendons. One can observe in the drawing of the muscle at *b* the muscular substance somewhat swollen out, towards the tendinous radiations; this is due to the traction of the tendon. Through the strong flexion which is noticeable in this arm, the tendons become very tense, and then form such surfaces. Such studies are only to be made on the living model. It is well known that great difficulties are experienced in raising oneself above the mere forms of the anatomical theatre, and to properly

value in art the essence of anatomical study. In order to obviate these said difficulties, it has been the author's endeavour to produce in the drawings of the work the living forms of the muscles as characteristically as possible.

c. In a fully developed set of muscles it is well marked on the outer side of the arm (see Plate III.).

**d.* See Plate XIV. *b.*

**f.* See Plates IV., VI.

**g.* See Plate XIII. *f.*

**z.* The fasciculus of the deep tendon of the biceps lies on this muscle (see Plate XIV. *v'''*).

PLATE XVI.

A. Bones of the Flexed Arm.

Anterior and posterior aspect.

- | | |
|--|----------------------------------|
| *1. Olecranon. | *14. Infra-glenoid tubercle. |
| 2. External condyle of humerus. | 15. Humerus. |
| *3. Head of radius. | 18. Head of ulna. |
| *4. Clavicle. | 20. Radial tubercle. |
| 5. Acromion process. | *21. Head of humerus. |
| *6. Triangular surface at end of spine of scapula. | 22. Trapezium. |
| 7. Metacarpal bone of thumb. | 23. Metacarpal bones. |
| 8. Styloid process of radius. | 24. Pisiform bone. |
| 12. Inferior angle of scapula. | 25. Internal condyle of humerus. |
| | 32. Surface of ulna. |

NOTES.

- *1. In a posterior aspect one sees above this, on the humerus, the fossa intended for it (Olecranon fossa).
- *3. The rotation of the hand takes place *only* by means of the radius; if one places one's finger on the head of the radius of one's own arm, every movement of it can be felt (see Plate XVII. 11, and Plate III.).

- *4. The internal joint surface articulates with the manubrium sterni (see Plates I., XII.).
- *6. See Plate XII.
- *14. See Plate XII.
- *21. The groove between the two tuberosities of the humerus serves as a channel for the tendon of the long head of the biceps (bicipital groove).

Compare the drawings of the skeleton with those of the muscles; the numbers are arranged in such a way that the parts of the skeleton that are uncovered by muscle agree with the skeleton of the same plate.

PLATE XVI.

B. Muscles of the Flexed Arm.

Anterior and posterior aspect.

- **a.* Deltoid muscle.
- b.* Biceps muscle.
- c.* Brachialis anticus muscle.
- **d.* Triceps muscle.
- f.* Latissimus dorsi muscle.
- **k.* Abductor indicis.
- **n.* Supinator longus.
- o.* Extensor carpi radialis brevior.

- **p.* Extensor communis digitorum.
- q.* Extensor carpi radialis longior.
- s.* Extensor primi internodii pollicis.
- t.* Abductor pollicis.
- **u.* Anconeus muscle.
- v.* Flexor carpi ulnaris.
- w.* Extensor carpi ulnaris.

NOTES.

**a.* See Plates XIII. *c.*, III.

**d.* Through its passive behaviour the extensor tendon is applied to the posterior surface of the humerus, so that one can distinctly perceive the underlying fossa (olecranon fossa).

**k.* See Plate XVII. *a.*

**n.* Next to the tendon of this muscle, from the radial to the ulnar side, lie the flexor longus pollicis, flexor carpi radialis, and palmaris longus muscles.

**p.* See Plate XVII. *s.*

**u.* See Plate XIV. It lies on the surface of the ulna which is free from muscle (see 32 of this plate), passes and over into a furrow which extends up to the head of the ulna, by means of which the muscles of the fore-arm are divided into an extensor and flexor group (see the arm of the Athlete).

PLATE XVII.

A. Bones of the Hand.

- | | |
|---|---------------------------------|
| *1. Metacarpal bone of thumb. | *11. Styloid process of radius. |
| *2. Metacarpal bones. | *12. Radius. |
| *3. First phalanx of fingers. | 13. First phalanx of thumb. |
| *4. Middle phalanx of fingers. | 14. Terminal phalanx of thumb. |
| *5. Terminal phalanx of fingers. | 15. Base of phalanges. |
| *6. Tubercle at base of second metacarpal bone. | 16. Pisiform bone. |
| *7. Trapezoid bone. | *17. Head of ulna. |
| 8. Scaphoid bone. | *18. Os magnum. |
| 9. Semilunar bone. | 19. Unciform bone. |
| *10. Trapezium. | 20. Cuneiform bone. |

NOTES.

- *1. The metacarpal bone of the thumb is more movable in comparison with the other metacarpal bones. The thumb and big toe have on their flexor surface two small disc-shaped bones—the sesamoid bones. They are left out in the drawings. The dorsal surface of the metacarpal bone of the thumb is placed somewhat laterally with regard to the dorsal surfaces of the other metacarpal bones.
- *2. They are counted from the thumb, and are the least movable portions of the hand. The fourth is the weakest.
- *3, *4, *5. The joints of the fingers require some attention in their treatment. If the fingers be extended, then the prominences are formed by the ends of the first phalanges (see Plate XVII. 15). If they be flexed at these points, then the ball-shaped trochlear surfaces of the metacarpal bones become prominent, and these form then the knuckles. According to the amount of fat present in the individual, the extensor tendons of the fingers, which in this position remain passive, will appear more or less marked in consequence of the stretching of the skin. In the flexion of the second joints similar prominences are not observed; there are here rather protruding surfaces, which are produced partly by the anterior joint surface of the first phalanx, and by the base of the second phalanx. The same condition obtains in the third phalangeal joints.
- *6. It marks the transition of the hand into the wrist, and serves as a point of insertion of the extensor carpi radialis longior.
- *7. Eight small bones form the carpus. It consists of two

rows, a first or upper one (*i.e.* with the arm pendulous), and a second or lower one. To commence from the radial side, those forming the first row are as follows:—

Scaphoid.	Cuneiform.
Semilunar.	Pisiform.

The first three form the joint between the fore-arm and hand. The following are those of the second row:—

Trapezium.	Os magnum.
Trapezoid.	Unciform.

- *10. The carpal bones are not so unimportant for the artist as is generally believed (see the hand on the plates of the Athlete). During the movements of the hand they prevent an angular bending, which without them could not be avoided. With artistic feeling and understanding a considerable effect can be produced in the contours of the wrist-joint.
- *11. If one imagines with the arm pendulous a horizontal line drawn from the lowest point of the styloid process of the radius towards the ulnar side, one finds the head of the ulna lying higher.
- *12. If the radius rotates on its own axis the whole hand must follow it, consequently the radius always moves with every movement of the hand. If the artist wishes to comprehend clearly the complicated forms and surfaces of the fore-arm he must thoroughly understand the different movements of the wrist and elbow joints.
- *17. A perpendicular line drawn through the head of the ulna furnishes the axis around which the radius and the hand rotate.
- *18. The os magnum is the largest bone of the carpus.

PLATE XVII.

B. Muscles of the Hand.

- | | |
|--|---|
| * <i>a.</i> Abductor indicis. | <i>n.</i> Extensor carpi ulnaris. |
| * <i>b.</i> Thenar eminence. | <i>o.</i> Flexor carpi radialis. |
| * <i>c.</i> Adductor pollicis. | <i>q.</i> Tendon of abductor indicis. |
| * <i>d.</i> Inner interosseous muscles (palmar). | <i>r.</i> Tendons of flexors of fingers. |
| <i>f.</i> Extensor primi internodii pollicis. | <i>s.</i> Extensor communis digitorum. |
| <i>g.</i> Flexor longus pollicis. | <i>t.</i> Extensor indicis. |
| <i>h.</i> Extensor ossis metacarpi pollicis. | <i>u.</i> Extensor minimi digiti. |
| <i>i.</i> Extensor secundi internodii pollicis. | * <i>v.</i> Hypothenar eminence. |
| <i>k.</i> Extensor carpi radialis breviar. | * <i>w.</i> Outer interosseous muscles (dorsal). |
| <i>l.</i> Extensor carpi radialis longior. | <i>x.</i> Tendinous slips between extensor tendons. |
| <i>m.</i> Annular ligament of wrist. | * <i>y.</i> Tendons of phalanges. |

NOTES.

- | | |
|--|--|
| * <i>a.</i> The two heads of this muscle remain separate longer than those of the others; the head arising from the metacarpal bone of the thumb is described as the abductor indicis. | * <i>r.</i> Is formed of three muscles. |
| * <i>b.</i> Is composed of four muscles. | * <i>v.</i> They draw away the fingers from the middle line of the hand, and are therefore called abductors. They fill up the spaces between the metacarpal bones. |
| * <i>c.</i> The most powerful muscle of the ball of the thumb. | * <i>y.</i> The extensor tendons of the fingers are divided into three slips on the back of the first phalanx; the middle one is inserted into the upper part of the second phalanx, and the lateral bands into the sides of the terminal phalanx. |
| * <i>d.</i> All these muscles are adductors. They draw the fingers towards the middle line of the hand, this line passing through the middle finger. | |

PLATE XVIII.

Bones of the Pelvis.

Anterior, posterior and lateral aspect.

- | | |
|---|--|
| *1. Anterior superior iliac spine. | 17. Crest of ilium. |
| *2. Anterior inferior iliac spine. | 18. External lip of iliac crest. |
| *3. Great trochanter. | 19. Internal lip of iliac crest. |
| 4. Lesser trochanter. | 20. Ilium. |
| 5. Neck of femur. | *21. Sacrum. |
| 6. Pubic symphysis. | *22. Second sacral vertebra. |
| *7. Tuber ischii. | 23. Acetabulum for head of femur. |
| *8. Ischium. | 24. Digital fossa. |
| 9. Spine of pubis. | 25. Body of a lumbar vertebra. |
| 10. Pubic bone. | 26. Intervertebral disc. |
| 11. Spine of ischium. | 27. Transverse processes. |
| 12. Head of femur. | 28. Fusion of bodies of sacral vertebræ. |
| 13. Posterior inferior iliac spine. | 29. Spinous processes. |
| 14. Posterior superior iliac spine. | 30. Femur. |
| 15. Articular processes of lumbar vertebræ. | 31. Articular surface of vertebra. |
| 16. Third lumbar vertebra. | 32. Coccyx. |

NOTES.

In order to reproduce in the easiest and most correct manner the position of the pelvis, a horizontal line in the upright figure should be drawn from the tip of the coccyx towards the symphysis pubis, which line must pass through the lowest point of the latter. If the points of the pelvis noticeable under the skin have been brought into a proper relation with each other (attention having been paid to the foregoing), then the position and form of this same will produce a right impression.

- *1. In lateral movements of the pelvis the anterior superior spines furnish (in a front view) guiding points for the proper representation of the same, if one imagines the two to be united by a horizontal line.
- *2. In the same way the anterior and posterior iliac spines furnish an important guide for the true rendering of the

several inclinations forwards and backwards of the pelvis.

- *3. See Plate XIX. of the Skeleton and those of the Athlete.
- *7. It is covered in the erect position by the gluteus maximus, which latter, however, in the act of sitting, changes its position so that the tuber ischii may not be pressed upon the muscle by the weight of the body.
- *8. The ischium is divided into the body, the descending ramus and the ascending ramus.
- *21. This is wedged in between the two innominate bones, the lateral walls of which form the true pelvis.
- *22. With the body bent forward, there are traces visible under the skin of the spinous processes of the sacral vertebræ, on the back of the model. In lean individuals the case is the same in the upright position.

PLATE XIX.

A. Bones of the Extended Leg.

Anterior and posterior aspect.

- | | |
|------------------------------------|--------------------------------------|
| *1. Anterior superior iliac spine. | 15. Head of fibula. |
| *2. Anterior inferior iliac spine. | *16. Tibia. |
| 3. Great trochanter. | 17. Fibula. |
| 4. Lesser trochanter. | *18. External malleolus. |
| *5. Pubic symphysis. | *19. Internal malleolus. |
| *6. Head of femur. | *20. Trochlear surface of femur. |
| 7. Acetabulum. | *21. Linea aspera. |
| *8. Tuber ischii. | *22. Posterior superior iliac spine. |
| *9. External condyle of femur. | *23. Posterior inferior iliac spine. |
| *10. Internal condyle of femur. | *24. Coccyx. |
| *11. Patella. | 25. Astragalus. |
| 12. External tuberosity of tibia. | 26. Os calcis. |
| 13. Internal tuberosity of tibia. | 27. Base of fifth metatarsal bone. |
| *14. Tibial spine. | *28. Femur. |

NOTES.

- | | |
|--|---|
| *1. See the pelvis, Plate XVIII. | of which it is embedded (see Plate XIX. <i>y</i> and <i>z</i> , and Plate XXII.). |
| *2. See Plate XVIII. | |
| *5. See Plate XVIII. | *14. Point of insertion of the quadriceps femoris tendon. |
| *6. Forms, with the acetabulum, the hip-joint. | *16. The general form of the leg is partly dependent on the form of the tibia, which is certainly somewhat curved, but by no means excessively so (see Plates I., II.). |
| *8. Is covered by the gluteus maximus in the upright position (see Plates I., XVIII.). | *18, *19. See Plate XXII. |
| *9, *10. One notices a concave surface between the two condyles on the anterior aspect of the femur; it is the articular surface for the patella, on which the same moves up and down during the flexion and extension of the leg (see the explanation of the muscle of this plate <i>y</i> and <i>z</i> , and Plate XXII.). | *20. See Plate XXII. |
| *11. Is united with the extensor tendon, in the lower portion | *21. Serves as a point of insertion for the adductors. |
| | *22 and *23. See Plate XVIII. |
| | *24. See Plate XVIII. |
| | *28. See Plates I., II., XX. |

PLATE XIX.

B. Muscles of the Extended Leg.

Anterior and posterior aspect.

- | | |
|----------------------------|--|
| *a. Rectus femoris muscle. | *o. Soleus muscle. |
| *b. Vastus externus. | *p. Tibialis anticus. |
| *c. Vastus internus. | p'. Tendo Achillis. |
| *d. Sartorius muscle. | *q. Flexor longus digitorum. |
| *e. Gracilis muscle. | *r. Peroneus brevis. |
| *f. Adductor longus. | *s. Tendon of extensor longus hallucis. |
| g. Pectineus muscle. | *t. Peroneus longus muscle. |
| *h. Ilio-psoas muscle. | u. Tibialis posticus muscle. |
| *i. Tensor vaginæ femoris. | *v. Semi-membranosus muscle. |
| *k. Gluteus medius muscle. | *w. Semi-tendinosus muscle. |
| l. Biceps femoris muscle. | *x. Gluteus maximus muscle. |
| l'. Short head of same. | *y. Extensor tendon of quadriceps femoris. |
| *n. Gastrocnemius muscle. | *z. Pad of fat below patella. |

NOTES.

- *a, *b, *c. These four muscles (including the crureus, which lies under the rectus femoris) are described as forming the four heads of the extensor quadriceps muscle. The muscular fibres of this muscle are inserted into a common tendon above the patella. The outer head lies deeper than the inner one (see Plate XX., and the plates of the Athlete).
- *d. The name of this muscle is founded upon an erroneous conception of its function. It does not draw one leg over the other, as is seen in the tailor at work, but aids in adducting the leg, and rotates the flexed leg inwards on its own axis.
- *e. Its terminal tendon passes behind and under the sartorius, around the condyles of both femur and tibia, in order to be inserted on the inner surface of the latter.
- *f. By this and the pectineus the short adductor is covered.
- *h. Consists really of two muscles, the psoas and the iliacus.
- *i. As it stretches by its contraction the fascia lata, it will with further exertion so drag on this, that the vastus externus appears bound down by this fascia (see the plates of the Athlete). In the drawings of this plate the fascia lata is for the most part detached.
- *k. Its posterior half is covered by the gluteus maximus.
- *n. The external head is the smaller, and does not reach down so far as the inner one (see the appearances and outlines in Plates XIX., XX., and those of the Athlete). A powerful and at the same time a handsome shape of the male body is only then attained, if the muscle masses have been duly balanced in their relations to each other, and if the surfaces and outlines of the same have been depicted properly and with feeling.
- *o. This and the gastrocnemius muscle form the calf; the former is the stronger of the two (see the contour of the extended leg of this plate, of Plate XX., and those of the Athlete).
- *p. See the plates of the Athlete.
- *q. See Plate XXIII. b.

- *r. See Plate XXIII. l.
- *s. See Plate XXIII. h.
- *t. See Plate XXIII. k.
- *v. The substance of this muscle increases in thickness towards the popliteal space, and ends there suddenly in a tendon. As the knee can be flexed in two different ways, through the drawing down of the thigh or the drawing up of the leg, the form of the popliteal space must always vary.
- *w. Becomes tendinous in the middle, and runs behind and under the internal tuberosity of the tibia to be inserted into the inner surface of that bone.
- *x. Its large muscular bundles pass obliquely downwards and outwards into a broad tendon (whereby the depression behind the trochanter major is produced), which is inserted partly into the fascia lata and partly into the linea aspera of the femur (see Plate XX.).
- *y. This tendon forms a flat band, under which the patella is fixed. The distance of this from the tibial spine is during all the movements of the knee the same; it is only with a very considerable flexion that it (*i.e.* the distance) becomes somewhat greater, through the stretching of the extensor tendon.
- *z. This lies under the extensor tendon and the patella, and is pressed outwards to left and right during the stretching of the former tendon. In order to be able to portray properly the movement in the knee-joint, an exact knowledge of the mechanical parts is necessary. A thorough study of plastic anatomy offers the great advantage of enabling one to work independently of the model. It will be no longer necessary to copy models, whereby most of the vital points are overlooked. How frequently one is unpleasantly struck, both in pictures and statues, by the exact delineation of the artist's model, with all the faults consequent on his or her former occupation unconsciously reproduced! Goethe says, "One sees only what one knows." Of what great advantage would this be to the artist if he knew what he saw!

PLATE XX.

A. Bones of the Extended Leg.

Internal and external aspect.

- | | |
|------------------------------------|--|
| *1. Anterior superior iliac spine. | 14. Internal malleolus. |
| 2. Pubic symphysis. | 15. Groove for tibialis posticus tendon. |
| 3. Spine of ischium. | 16. Lower articular end of femur. |
| 4. Tuber ischii. | 17. Upper end of tibia. |
| 5. Lesser trochanter. | 18. Inter-articular surface of knee. |
| 6. Posterior superior iliac spine. | *19. External condyle of femur. |
| *7. Anterior inferior iliac spine. | 20. Head of fibula. |
| 8. Neck of femur. | 21. External malleolus. |
| *9. Patella. | *22. Great trochanter. |
| *10. Internal condyle of femur. | 23. Head of femur. |
| *11. Spine of tibia. | 24. Spine of pubis. |
| *12. Tibia. | 25. Femur. |
| *13. Fibula. | *26. Articular surface of patella. |

NOTES.

*1. See pelvis, Plate XVIII. 1.

*7. See Plate XVIII.

*9. The patella is most marked in the upright position; its upper margin is particularly well defined in the model.

*10. See Plate XIX. 10.

*11. The extensor tendon in which the patella is embedded is very prominent during forcible flexion (see Plate XXI.).

*12. The inner surface of the tibia remains almost entirely uncovered by muscles: this is an essential feature in the portrayal of the leg (see Plates XIX., XXI.).

*13. One can see the head of the fibula, the external malleolus and a few inches of the former free from muscular tissue.

*19. See Plate XIX. 9.

*22. The proper position of the great trochanter requires an attentive observation of the model, the more so as this same is dependent upon pelvic movement (see Plates I., II.).

*26. See Plates XIX., XX., XXI.

PLATE XX.

B. Muscles of the Extended Leg.

Internal and external aspect.

- | | |
|--|--|
| * <i>a.</i> Rectus femoris. | * <i>f.</i> Gluteus maximus muscle. |
| <i>a'.</i> Common extensor tendon. | * <i>g.</i> Biceps femoris. |
| * <i>b.</i> Vastus externus. | * <i>h.</i> Gastrocnemius. |
| <i>b'.</i> Portion of fascia lata. | <i>h'.</i> Tendinous surface of gastrocnemius. |
| <i>b''.</i> Attached surface of fascia lata. | * <i>i.</i> Soleus muscle. |
| * <i>c.</i> Long head of biceps femoris. | * <i>j.</i> Ilio-psoas muscle. |
| * <i>c'.</i> Short head of same. | * <i>k.</i> Peroneus longus muscle. |
| * <i>d.</i> Tensor vaginæ femoris. | <i>l.</i> Tendon of same. |
| * <i>e.</i> Gluteus medius muscle. | * <i>m.</i> Tibialis anticus muscle. |

NOTES.

- **a.* See Plate XIX. Arises by a short, strong tendon from the anterior inferior spine of the ilium and from the margin of the acetabulum, runs over the hip-joint, and is inserted about four fingers' breadth above the patella into the common extensor tendon. It extends the leg and draws the thigh to the abdomen.
- **b.* Arises from the base of the trochanter major and the external lip of the linea aspera of the thigh, and is inserted by its own tendon partly into the patella and partly into the common extensor tendon (see Plates XIX., XX., XXI., and the plates of the Athlete).
- **c.* See *g* of this Plate.
- **c'.* See *g*.
- **d.* Arises from the anterior superior iliac spine; runs from the great trochanter down into the fascia lata, stretches the fascia and assists in rotating the thigh inwards (see Plate XIX. and plates of the Athlete).
- **e.* Is partly covered by the gluteus maximus, arises from the external lip of the iliac crest and the outer surface of the ilium, and passes downwards to the point of the great trochanter. It abducts the leg (see Plates IV., VI., VII., VIII.).
- **f.* It arises from the posterior portion of the lip of the iliac crest, from the surface of the sacrum and the margin of the coccyx, is formed into a broad, strong tendon which is inserted into the upper border of the linea aspera of the femur.
- **g.* Arises by its long head from the tuber ischii, is joined in its course by the short head arising from the outer margin of the linea aspera, and is inserted into the head of the fibula. It flexes the leg (see the plates of the Muscle-figure and of the Athlete).
- **h.* Arises by two heads above the two condyles of the femur. These pass over in a curved line into a broad common tendon, which is fused with the tendo Achillis. The

external head is weaker and shorter than the other (see the plates of the Athlete).

- **i.* Is very strong and fleshy; it arises from the posterior portion of the head of the tibia and from the fibula, as well as from the upper internal border of the tibia, is broadest in the middle, becomes narrower inferiorly, and passes into the tendo Achillis with a very strong and broad terminal tendon, which is united with that of the gastrocnemius muscle (see Plates XIX., XX., and those of the Athlete).
- **j.* Consists really of two muscles, the psoas magnus and the iliacus; the former arises from the transverse processes of the last dorsal and the lumbar vertebræ. The muscular mass becomes smaller as it descends and leaves the pelvis by passing beneath Poupart's ligament, and is inserted into the lesser trochanter of the femur. The latter arises from the inner lip of the iliac crest, and is inserted by fusing with the psoas tendon. Both rotate and flex the thigh.
- **k.* Arises by two portions, one from the head of the fibula, the other from the upper surface below the head of the same. The long tendon of this muscle runs down on the posterior side of the outer malleolus through a groove, bends forward, runs over the tubercle of the cuboid to the inner margin of the foot, where it is inserted into the internal cuneiform bone. It turns the foot somewhat outwards and extends it.
- **m.* Arises from the external tuberosity and corresponding surface of the tibia; its tendon passes inwards over the ankle-joint in order to be inserted into the internal cuneiform bone and into the base of the metatarsal bone of the great toe. It turns the foot upon its outer margin by raising the inner border, and it also flexes the foot (see the plates of the Athlete, and the notes of Plate VII.).

PLATE XX. MUSCLES OF THE EXTENDED LEG—*continued*.

m'. Tendon of same.
**n*. Extensor communis digitorum.
**n'*. Tendons of same.
**o*. Annular ligament.
p. Extensor brevis digitorum.
**q*. Semi-tendinosus muscle.
q'. Tendon of same.
**r*. Pad of fat over knee-joint below extensor tendon.

**s*. Flexor longus digitorum.
**t*. Tibialis posticus muscle.
**u*. Sartorius muscle.
**v*. Gracilis muscle.
**w*. Semi-membranosus muscle.
**x*. Adductor magnus muscle.
**y*. Adductor longus muscle.
**z*. Vastus internus muscle.

NOTES.

**n*. See Plates XXIII. *m*, XXIV.

**n'*. See Plate XXIII.

**o*. See Plate XXIII. *f*, and the plates of the Athlete.

**q*. It arises from the tuber ischii, and is fused with the biceps femoris muscle. As it descends it becomes more slender, and passes down the middle of the thigh into a band-like tendon. It runs behind the inner tuberosity of the tibia, and is inserted into the inner surface of the tibia in the neighbourhood of the tibial spine. It assists in flexing the leg.

**r*. See Plates XIX., XXI.

**s*. Arises from the posterior surface of the tibia, and running down to the internal malleolus, passes behind it as a long tendon. It runs in a sheath common to it and the tibialis posticus to the side of the foot. From the inner surface of the os calcis it receives a second head, and divides into four portions, which go to the four outer terminal phalanges (see Plate XXIII. *b*).

**t*. It arises from the posterior superior surface of the tibia, between the flexor longus digitorum and flexor longus pollicis. Its tendon commences in the middle of the leg, follows the posterior surface of the inner malleolus, and passing through the groove there, is inserted partly into the tuberosity of the scaphoid bone and partly into the plantar surface of the three cuneiform bones and the cuboid. It extends the foot and raises its inner margin (see Plate XXIII. *e*).

**u*. Arises from the anterior superior iliac spine, runs downwards and inwards in a long-drawn S-shaped line, and becomes tendinous below the inner side of the knee-joint. Its tendon turns towards the front at the inner tuberosity of the tibia, becomes more spread out, and is inserted into and near the tibial crest. If the leg be flexed it rotates it inwardly, in addition to assisting to adduct the leg (see Plates XIX., XX., and the plates of the Athlete).

**r*. Arises by a broad tendon from the symphysis pubis, and becomes tendinous in the middle of the thigh. This long tendon passes behind and under cover of the sartorius, and skirting the inner tuberosity of the tibia, is inserted by means of a triangular tendon on the inner surface of the anterior crest of the tibia. It flexes the leg (see Plates XIX., XX.).

**w*. Its broad tendon of origin extends on one surface of the muscle as far down as the middle of the thigh. At this point the terminal tendon begins on the other side of the muscular belly, and forms a considerable ridge a few fingers' breadth above the prominence of the knee; this suddenly passes into a powerful tendon, and is inserted into the posterior surface of the tibial tuberosity. It produces a similar effect to the preceding muscle (see Plates XIX., XX.).

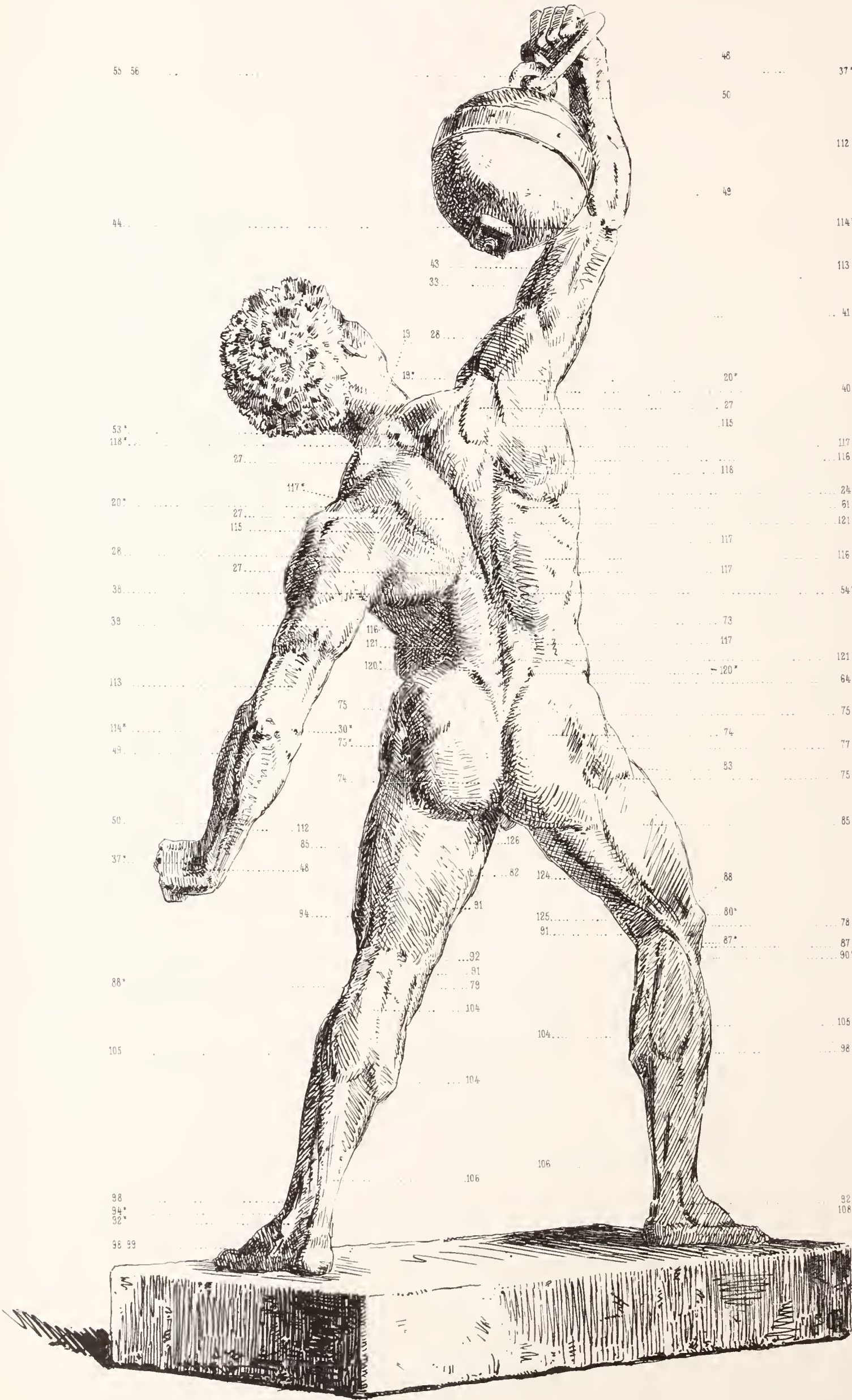
**x*. The adductor muscles all lie on the inner side of the thigh. This arises from the tuberosity of the ischium, as well as from the ascending ramus of the ischium and the descending ramus of the pubis. The lower third of the long broad terminal tendon is interrupted by a cleft, through which the femoral muscles pass to the popliteal space. It produces the adduction of the two thighs, as in the "gripping" of a horseman (see Plates XIX., III., V.).

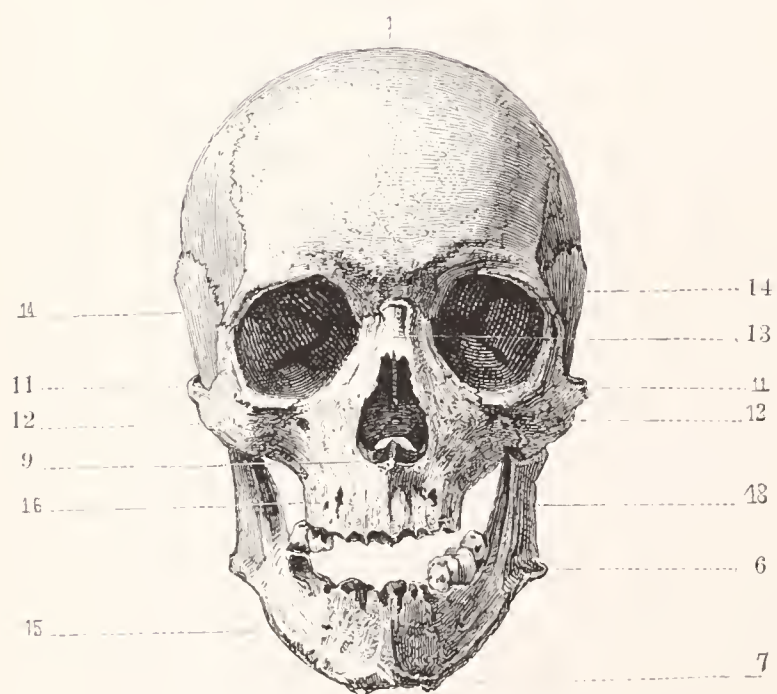
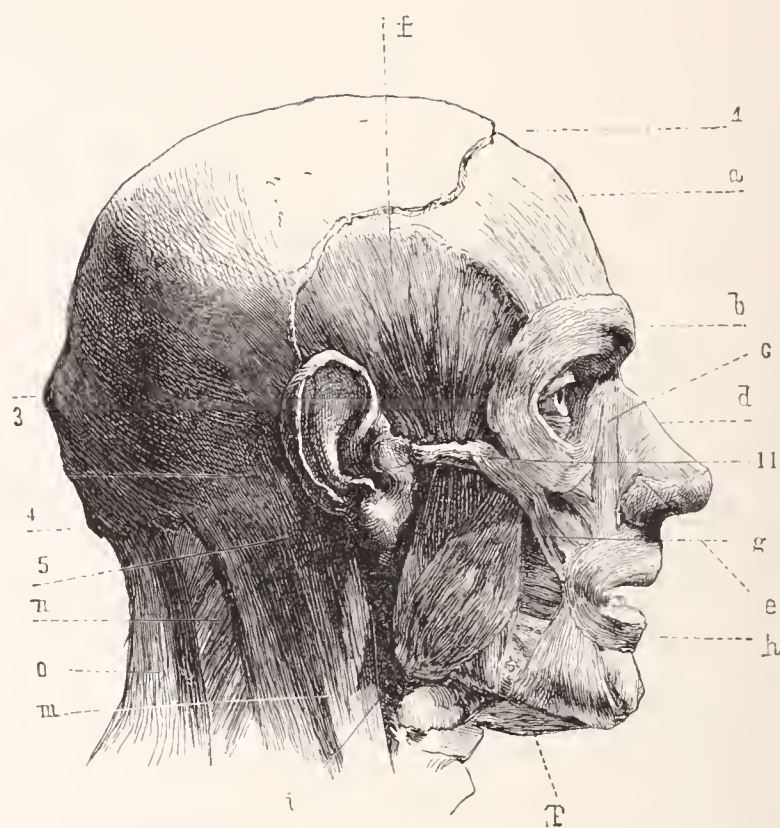
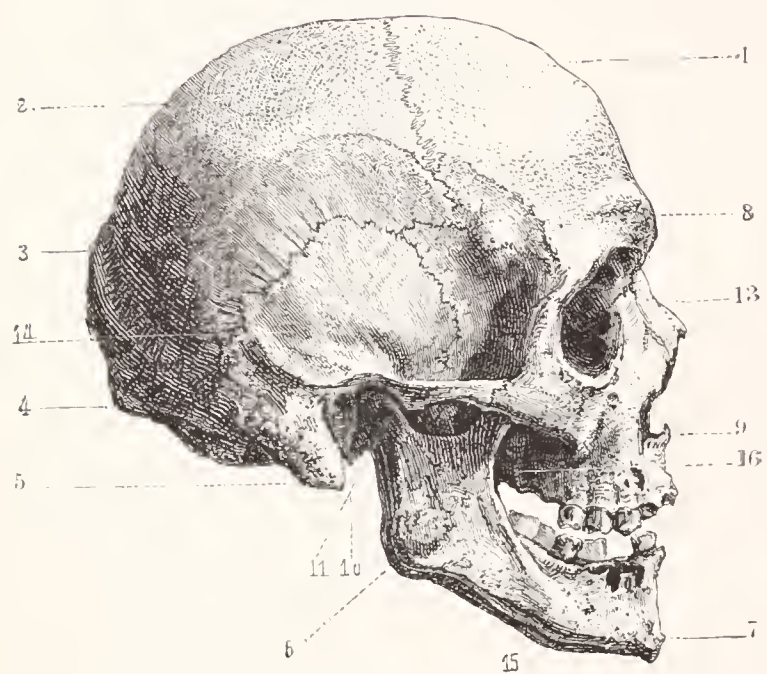
**y*. Arises by means of a short tendon from under the crest of the pubis external to the gracilis; it widens below, and is inserted about the middle of the thigh into the linea aspera. It acts like the foregoing.

**z*. It arises from the internal lip of the linea aspera, and develops towards its lower end a considerable muscular mass. A few of its fibre-bundles are inserted into the inner margin of the patella, and a portion of its tendon into the inner tuberosity of the tibia (see Plates XIX., XX., XXI., as well as the plates of the Muscle-figure and the Athlete).









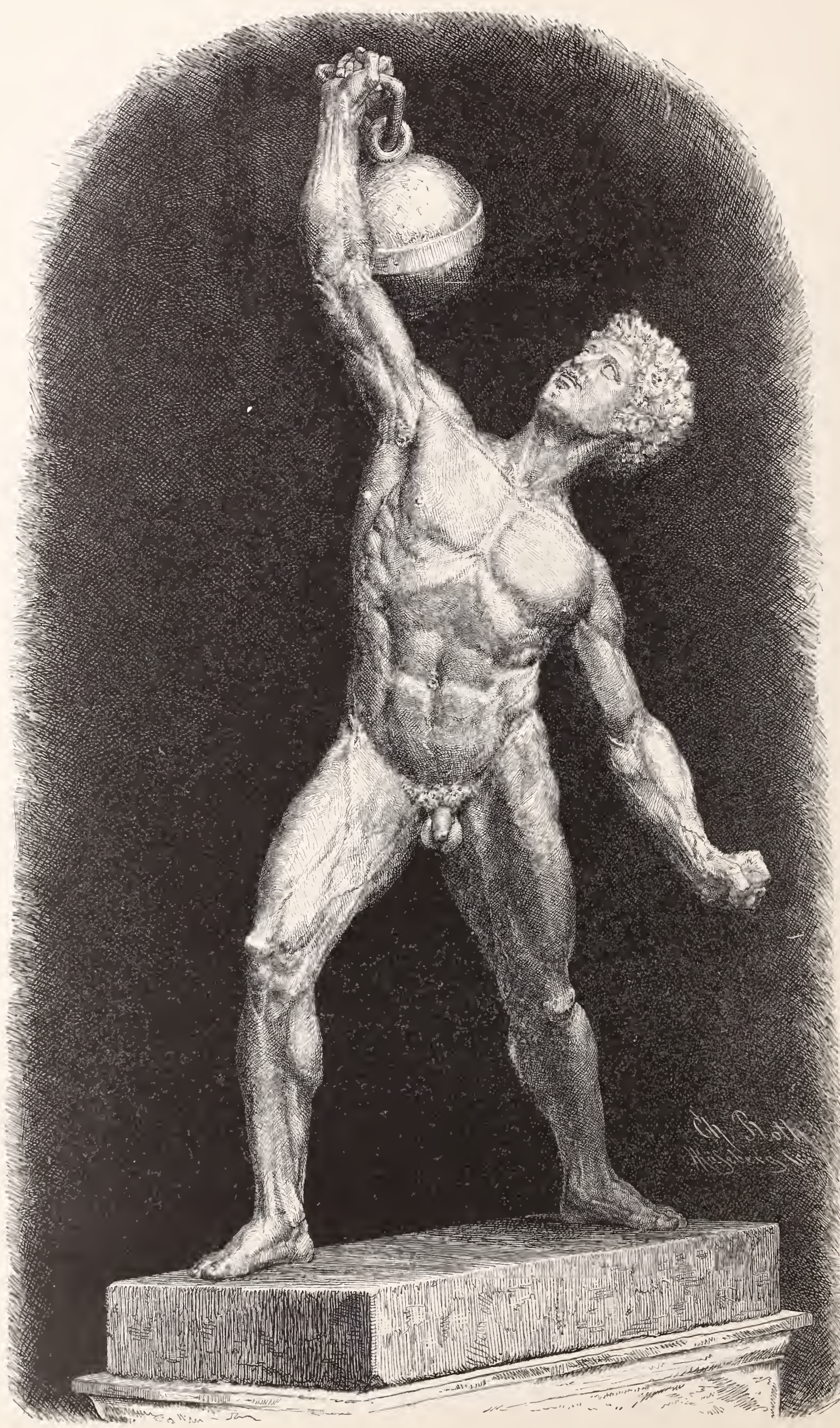








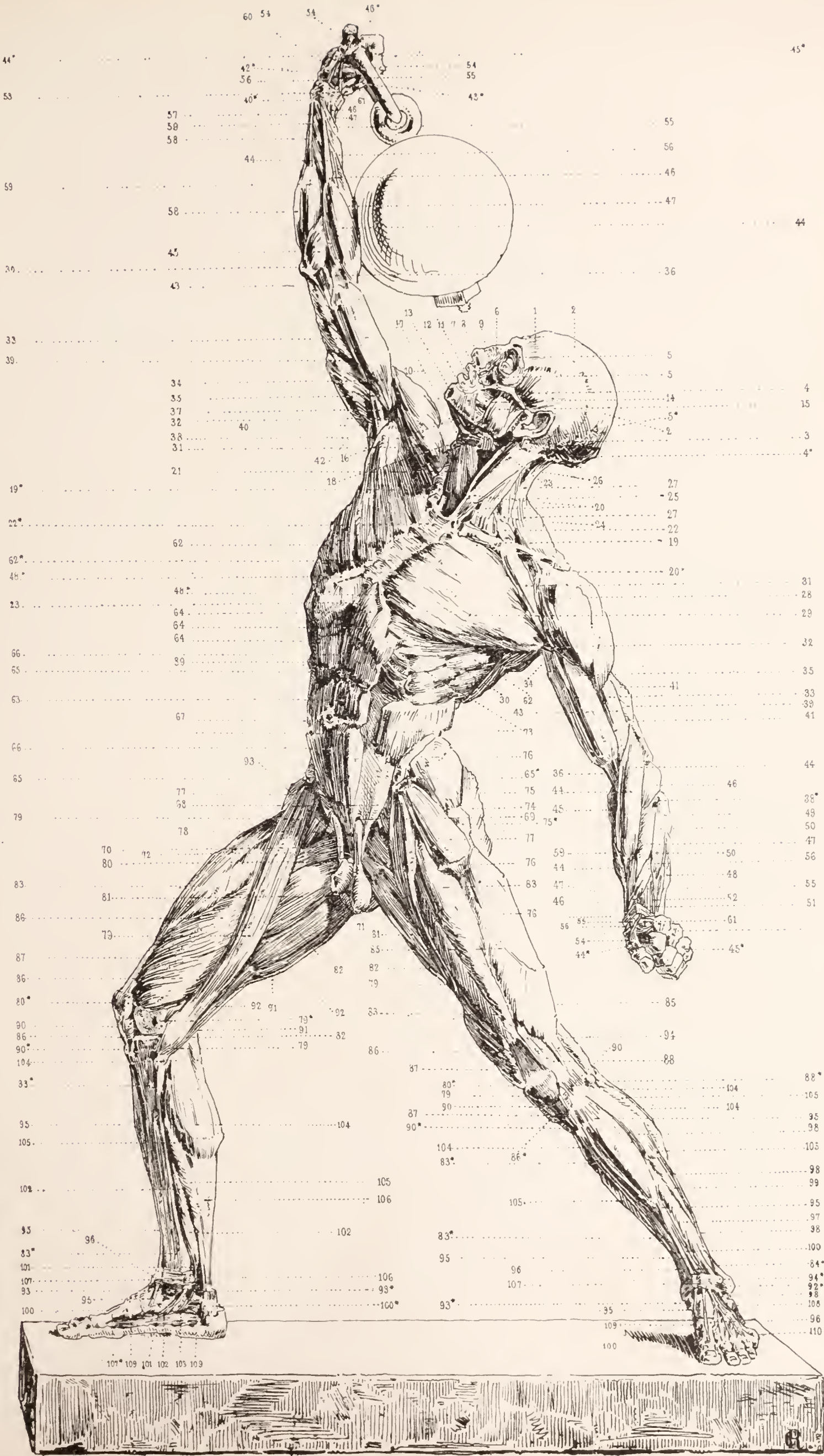
















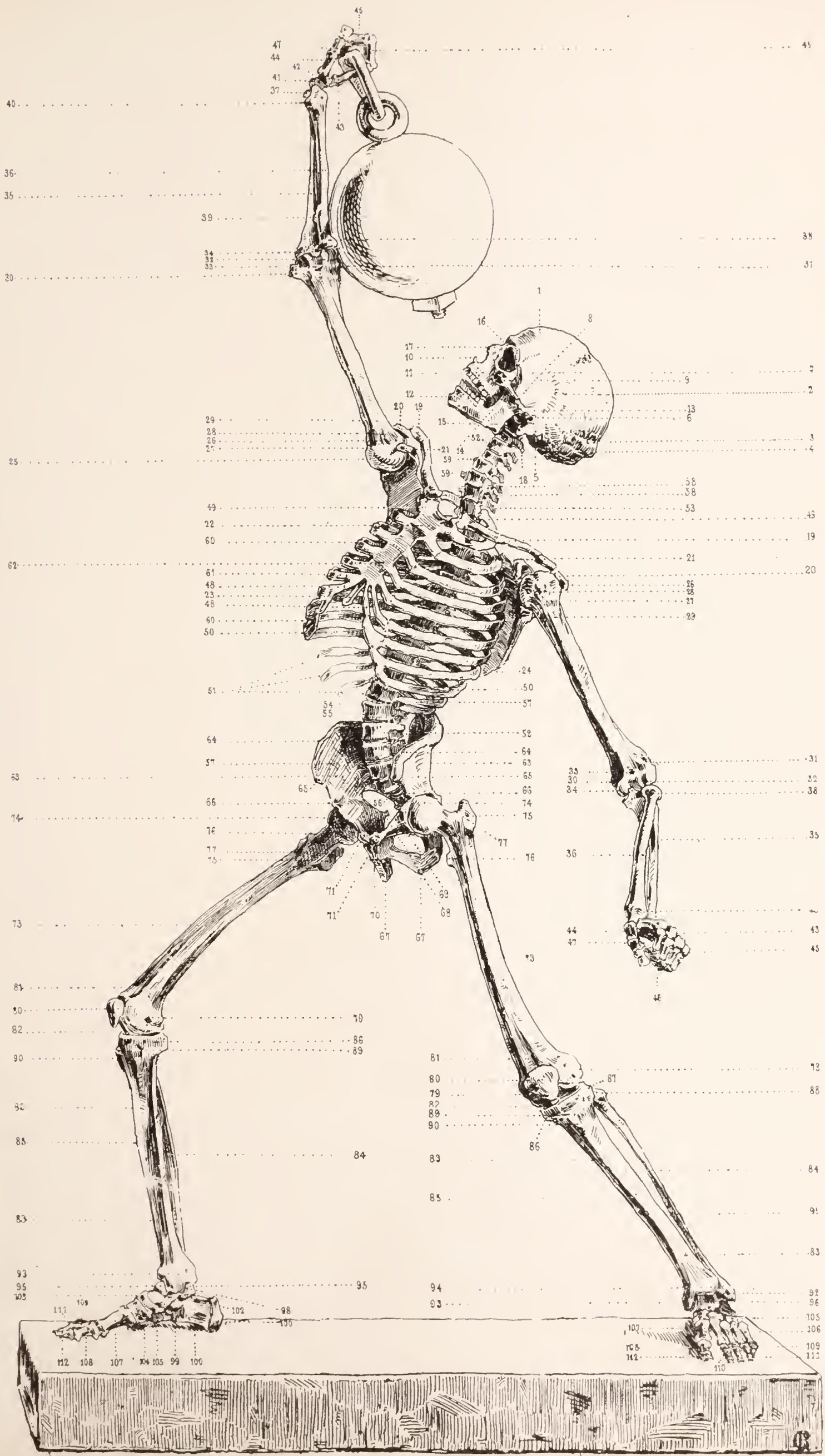




PLATE XXI.

A. Bones of the Flexed Leg.

Internal and external aspect.

- | | |
|---|---------------------------------|
| *1. Patella. | 11. Neck of femur. |
| 2. Articular surface of patella. | *12. Great trochanter of femur. |
| *3. External condyle of femur. | *13. Os calcis. |
| 7. Tibial spine. | *14. Internal condyle of femur. |
| 8. Articular surface at upper end of tibia. | 15. Lesser trochanter of femur. |
| 9. Head of fibula. | 16. Fibula. |
| 10. Head of femur. | 17. Tibia. |

NOTES.

*1. The patella is embedded in the common extensor tendon at its commencement; as this latter is only very slightly extensible, the patella will, even in the most powerful flexion, remain almost at the same distance from the tibial spine as in the extended leg. A small difference must be noted in the representation of the life-sized and larger than life-sized figures (see last note on the muscles of these plates).

*3. The internal condyle is lower and longer than the external, which is higher and shorter (see 4 and 5 of the drawing of this Plate).

*12. See Plate XX. 22, and Plate II. 75.

*13. See Plates XXIII., XXIV.

*14. See Note 3 of this plate.

PLATE XXI.

B. Muscles of the Flexed Leg.

Internal and external aspect.

- *a. Rectus femoris muscle.
- *a'. Extensor tendon of same.
- b. Vastus externus muscle.
- *c. Vastus internus muscle.
- *d. Biceps femoris muscle.
- d'. Long head of same.
- d''. Short head of same.
- *e. Gastrocnemius muscle.
- *f. Tibialis anticus muscle.
- g. Peroneus brevis muscle.
- *h. Extensor longus digitorum.
- i. Soleus muscle.

- *k. Peroneus longus muscle.
- k. Tendon of same.
- *l. Tensor vaginae femoris.
- *m. Semi-tendinosus muscle.
- n. Semi-membranosus muscle.
- *o. Adductor magnus.
- *p. Adductor longus.
- q. Ilio-psoas muscle.
- r. Sartorius muscle.
- s. Gracilis muscle.
- t. Tendo Achillis.
- u. Pad of fat in front of knee-joint.

NOTES.

- *a. See Plates XIX., XX. a. The superimposed layers of muscle above the knee are mostly reproduced incorrectly and vaguely, especially when the leg is flexed. In the drawing of the muscles of this plate the same are very clearly and characteristically shown. On the outer side of the thigh, one sees the rectus femoris and its tendon overlapping the vastus externus, then leaving the latter and the external condyle and running towards the patella (see the drawings of the muscles of this plate, and the note at foot of this).
 - *a'. The extensor tendon forms, in the figure of the athlete, a depressed surface (see plate of the Athlete).
 - *c. This muscle is raised up during flexion by the inner condyle of the femur (see c' of this plate).
 - *d. The broad, flat hollow on the external side of the thigh, which is produced on the extended leg by the patella and the short head of the biceps, disappears at the commencement of flexion. During a forcible flexion the biceps is partly overlapped by the vastus externus. If the flexion be still more forced this muscle appears to be divided into two parts by the superadded pressure of the gastrocnemius. In the region of the external condyle the short head is considerably extruded (see the drawing of this plate).
 - *e. In consequence of its origin it draws the thigh, and therefore the whole body, nearer to the floor, when the sole of the foot is flat on the ground.
 - *f. If the dorsum of the foot be raised, or the leg drawn downwards towards it, the belly of the muscle becomes thickened at the site of its origin (see Plate VII., note).
 - *h. See Plates XXIII., XXIV.
 - *k. In raising the body on the toes the belly of this muscle swells out, and its tendon appears on the model as a deep furrow running down to the external malleolus. Under it lies the peroneus brevis (see Plate XX.).
 - *l. If the thigh be brought nearer to the body this muscle is shortened, and in consequence of this it drags on the fascia of the thigh, whereby arises the deep groove and concavity over the vastus externus (see Muscle-figure IV., and figure of Athlete VIII.).
 - *m. It forms the inferior and inner contour of the thigh (see drawing of this plate, and those of the Athlete).
 - *o. See Plate XX. x.
 - *p. See Plate XX. y.
- The various changes which occur in the knee-joint

during flexion or extension are dependent chiefly upon the articular surfaces of the tibia and femur and the displacement of the patella. The displacements of this bone upwards and downwards (to which we have already referred in the plate of the Skeleton, note 1), is not noteworthy in the representations of small figures, and amounts only to a few lines in life-size figures. This is a rather important fundamental point for the proper portrayal of any movement at the knee-joint. Another point is the form of the common extensor tendon: this increases in breadth from its point of insertion at the tibial tubercle towards the patella, attains on the upper margin of that bone its greatest breadth, and becomes narrower from here to the fleshy insertion of the rectus femoris. If the extensor muscles are not in action, it lies on the anterior surface of the tibia, above the tibial tubercle. In front of the articular surface of the femur and tibia it is visible no longer. The shape of the patella (which lies under the common extensor tendon) is almost unrecognisable in this condition,—the more so as, especially in the erect attitude, the fat cushions before the knee are pressed out by the articular surfaces of the femur and tibia, and each of these pads of fat appears to be united with the inferior and lateral outlines of the muscles. If the extensors, however, are in action, the patella, with its peculiar shape, becomes more noticeable, the fat cushion is more isolated, and the common extensor tendon forms a roundish prominent band. At the extremity of this cushion of fat, towards the tibial tubercle, there are generally peculiar depressions to be seen (see the plates of the Athlete). The more considerable the flexion the more the patella disappears; its upper margin recedes, the lateral outlines become more indefinite, and the inner margin is more elevated by the internal condyle of the femur, as this latter is antero-posteriorly longer than the outer (see plate of Skeleton, note 14, and Plates XIX., XX.). The two condyles of the femur become more and more visible, especially their anterior superior angles (see Skeleton of these Plates 4, 5). The hollow on the thigh, in which the patella glides up and down in the erect position, becomes noticeable as an upward-running depression; the otherwise visible surface of the internal condyle becomes entirely covered by the vastus internus (see c' of this plate); that of the outer is to be recognised in its characteristic form under the skin. The tightly stretched extensor tendon is strongly marked under the skin, and presses back the fat-pads of the knee-joint into the cleft which is formed by the articular surfaces of the femur and the tibia.

PLATE XXII.

A. Bones of the Trunk.

- | | |
|-----------------------------------|-----------------------------------|
| *1. Manubrium sterni. | 6. Sixth rib. |
| 2. Sternum. | 7. Seventh rib. |
| *3. Xiphoid cartilage of sternum. | 8. Anterior superior iliac spine. |
| 4. Clavicle. | 9. Ninth rib. |
| 5. Acromion process. | *10. Tenth rib. |

NOTES.

*1. Forms at its junction with the sternum a well-marked protuberance, which, as it is seen in the model, loses itself in the surfaces of the two pectoral muscles (see Plates I., III. 2, V.).

*3. See Plates I. 23, III. 23, V.

*10. The eleventh and twelfth ribs float in the muscular

substance of the obliquus externus. One must pay attention to the movements and the outline of the trunk: every depression or elevation of this outline has its cause. On the extended side of the trunk one can very distinctly recognise the cartilaginous parts of the thorax with the ribs floating freely in the muscular tissue.

PLATE XXII.

B. Muscles of the Trunk.

- **a.* Pectoralis major muscle.
- a'.* Clavicular portion of same.
- **b.* Deltoid muscle.
- **c.* Rectus abdominis muscle.
- **d.* External oblique muscle.
- **e.* Internal oblique muscle.
- **f.* Gluteus medius muscle.
- **g.* Tensor vaginæ femoris.
- **h.* Sartorius muscle.

- **i.* Rectus femoris muscle.
- **k.* Vastus externus muscle.
- **l.* Intercostal muscles.
- m.* Serrations of serratus magnus.
- n.* Pectoralis minor muscle.
- **o.* Fibrous sheath of rectus abdominis muscle.
- q.* Spermatic cord.
- r.* Pectineus muscle.
- **s.* Latissimus dorsi.

NOTES.

**a.* On account of its broad origin the muscle bundles run together in such a manner (in their course towards the terminal tendon) that they cross each other (in the pendent arm), whereby the muscle becomes most powerful in this position. The proper delineation of this muscle contributes greatly to give proper expression to the chest.

**b.* The portion arising from the clavicle is separated from that arising from the acromion process by a furrow (see Plates XIII. *c.* III. 28).

**c.* It arises from the surfaces of the fifth, sixth and seventh costal cartilages, and from the ensiform process. It runs over the cartilaginous ends of the seventh and eighth ribs, and taking partial origin from these cartilaginous processes, it passes down to the pubic symphysis. Its bundles are interrupted by three or four, or sometimes even five, transverse tendinous slips or lineæ transverse (see the plate of the Athlete).

**d.* Arises by seven or eight serrations from the seven or eight lower ribs. The four upper serrations interlace with those of the serratus magnus, and the lower ones

insert themselves between the serrations of origin of the latissimus dorsi (see Plates III., IV., VI.). In the drawing of this plate it is removed on one side at the level of the tenth rib, in order to see the intercostal muscles and the internal oblique abdominal muscle (see Plate III. 62, and the other plates of the Athlete).

**e.* Is covered by the obliquus externus.

**f.* See Plates XIX. *z.*, XXII.

**g.* See Plates XIX. *i.*, XX.

**h.* See Plates XIX. *d.*, XX.

**i.* See Plates XIX., XX.

**k.* See Plates IV., VI., XX.

**l.* External and internal intercostal muscles. They co-operate in respiration.

**o.* It holds together the muscular body of the two recti, whereby they are enabled to develop a considerable power. The anterior layer is removed in all the plates of the Athlete, and partly in the drawing of this plate, in order to see the lineæ tendinæ transverse and the surfaces of the recti.

**s.* See Plates IV., VI.

PLATE XXII.

C. Bones of the Flexed Leg.

Anterior aspect.

- | | |
|----------------------------------|------------------------------------|
| *1. Patella. | 11. External malleolus. |
| 2. Tubercle of tibia. | *12. Angular promontory of tibia. |
| 3. External condyle of femur. | *13. Astragalus. |
| 4. Internal condyle of femur. | *14. Metatarsal bone of great toe. |
| 5. Internal tuberosity of tibia. | 15. Trochanter major. |
| 6. External tuberosity of tibia. | 16. Head of femur. |
| 7. Head of fibula. | *17. Femur. |
| *8. Tibia. | 18. Articular surface of femur. |
| 9. Crest of tibia. | 19. Articular surface of tibia. |
| 10. Internal malleolus. | |

NOTES.

- | | |
|--|--|
| *1. When the foot is flexed the patella recedes in consequence of the passive tension of its extensor tendon, and the more it is flexed the more it loses its shape. | *12. Is especially to be noticed in the extended foot. |
| *8. See Plates XIX. 16, XX., XXI. | *13. See Plate XXIV. |
| | *14. See Plates XXIII., XXIV. |
| | *17. See Plate XX. |

PLATE XXII.

D. Muscles of the Flexed Leg.

Anterior aspect.

<i>a.</i> Rectus femoris muscle.	<i>*f.</i> Gastrocnemius muscle.
<i>*a'.</i> Common extensor tendon.	<i>g.</i> Tibialis anticus muscle.
<i>*b.</i> Vastus externus muscle.	<i>h.</i> Peroneus brevis muscle.
<i>*c.</i> Vastus internus muscle.	<i>*i.</i> Extensor longus digitorum.
<i>*d.</i> Pad of fat under extensor tendon.	<i>*k.</i> Sartorius muscle.
<i>e.</i> Soleus muscle.	<i>l.</i> Peroneus longus muscle.

NOTES.

<i>*a.</i> See Plate XIX. <i>a.</i>	tendon during flexion, is pressed back between the two articular surfaces.
<i>*b.</i> See Plates XX., XXI.	<i>*f.</i> See Plate XIX. <i>n.</i>
<i>c.</i> See Plates XX., XXI.	<i>*i.</i> See Plate XXIV.
<i>*d.</i> This prominence, through the stretching of the extensor	<i>*k.</i> See Plates XIX. <i>d</i> , XX.

PLATE XXIII.

A. Bones of the Foot.

Lateral aspect.

- | | |
|--|--|
| <p>*1. Terminal phalanx of great toe.
 2. First phalanx of great toe.
 *3. Globular head of metatarsal bone of great toe.
 4. Second metatarsal bone.
 *5. Metatarsal bone of great toe.
 *6. Middle cuneiform bone.
 7. Scaphoid.
 *8. Astragalus.
 *9. Internal malleolus.
 10. Sulcus for tibialis posticus and flexor longus digitorum.
 *11. Os calcis.
 12. Protuberance at base of fifth metatarsal bone.</p> | <p>13. Cuboid.
 14. Tuberosity of os calcis.
 *15. External malleolus.
 16. Fifth metatarsal bone.
 17. Globular head of fifth metatarsal bone.
 18. Base of first metatarsal bone.
 19. Base of first phalanx of great toe
 20. External cuneiform bone.
 *21. Sustentaculum tali.
 22. Sulcus for peroneus longus.
 23. First phalanges.
 24. Middle phalanges.
 25. Terminal phalanges.
 26. Internal cuneiform bone.</p> |
|--|--|

NOTES.

- | | |
|---|--|
| <p>*1. The middle phalanx is wanting (see Plate XVII. 1).
 *3. If the foot be pressed to the ground, it will rest upon the heads of the five metatarsal bones, especially the first and the fifth and the tuberosity of the os calcis. By its elastic quality the foot obtains a firm hold upon uneven ground.
 *5. First metatarsal bone.
 *6. The tarsus is formed by seven strong bones:—
 Astragalus. Cuboid.
 Os calcis. Three cuneiform bones.
 Scaphoid.
 *8. In extreme flexion downwards one can see on the side of the external malleolus the anterior angle of the astragalus arise.</p> | <p>*9. The contours of the inner side of the foot are especially formed by skeletal parts, only towards the sole of the foot is situated the abductor pollicis.
 *11. Terminates posteriorly at the tuberosity of the os calcis.
 *15. Great attention has to be paid to the position of the two malleoli; in consequence of the very strong ligaments which fasten the fibula to the tibia, the movement of the foot around the axis of the former is not very great; there is, however, a change of shape to be noticed in the relief of the foot.
 *21. Is a strongly developed osseous process on the os calcis which assists in bearing the astragalus.</p> |
|---|--|

PLATE XXIII.

B. Muscles of the Foot.

Lateral aspect.

- | | |
|---|--|
| * <i>a.</i> Abductor pollicis. | * <i>i.</i> Tibialis anticus muscle. |
| * <i>b.</i> Flexor longus digitorum. | * <i>k.</i> Peroneus longus muscle. |
| <i>b'.</i> Tendon of same. | * <i>l.</i> Peroneus brevis muscle. |
| <i>c.</i> Tendon of abductor pollicis. | * <i>m.</i> Extensor communis digitorum. |
| * <i>d.</i> Flexor longus pollicis. | <i>n.</i> Tendons of same. |
| * <i>e.</i> Tibialis posticus muscle. | * <i>o.</i> Extensor brevis digitorum. |
| <i>f.</i> Annular ligament. | * <i>p.</i> Peroneus tertius. |
| <i>g.</i> Tendo Achillis. | <i>q.</i> Abductor minimi digiti. |
| * <i>h.</i> Tendon of long extensor of great toe. | |

NOTES.

- | | |
|--|--|
| * <i>a.</i> Consists of several bundles of muscle (see <i>a'</i> of this plate). | * <i>l.</i> Lies under the peroneus longus muscle, and ends at the base of the fifth metatarsal bone. |
| * <i>b.</i> Lies next to the tibialis posticus muscle, which it covers almost entirely; forms a long tendon which lies behind the malleolus, and then runs down to the side of the foot, where it divides into four fasciculi in order to reach the terminal phalanges of the four toes. | * <i>m.</i> The tendon of this muscle divides itself into five fasciculi, the four innermost go to the second, third, fourth and fifth toes, and form, as in the phalanges of the fingers, a tendinous aponeurosis on the dorsum of the toes. If the muscle substance, from which the fifth tendon has its origin, is separated higher up from the other tendons, it is called the peroneus tertius (see Plate XXIV.). |
| * <i>d.</i> Passes behind the astragaloid process to the sole of the foot, and is inserted into the terminal phalanx of the great toe. | * <i>o.</i> Its tendons run with the tendons of the common extensor obliquely forwards over the back of the foot (see Plate XXIV.). |
| * <i>e.</i> Lies next to the common flexor of the toes. | * <i>p.</i> Arises from the outer and posterior surface of the tuberosity of the os calcis and from the bony promontory at the base of the fifth metatarsal bone. |
| * <i>h.</i> See Plates XIX. <i>s</i> , XXIV. | |
| * <i>i.</i> See Plate XIX. <i>p</i> . | |
| * <i>k.</i> Passes deeply down on the outer side of the leg, and is then directed obliquely inwards to the base of the first metatarsal bone. It extends the foot and supports it on the border of the great toe (see Plate XIX. <i>t</i>). | |

* * Those parts in the drawing of the foot which are made noticeable by lines without letters indicate the presence of fat.

PLATE XXIV.

A. Bones of the Foot.

Dorsal and plantar aspects.

- | | |
|---|---|
| *1. Internal malleolus. | *13. Tuberosity at base of fifth metatarsal bone. |
| *2. External malleolus. | *14. First metatarsal bone. |
| 3. Inner angle of tibia. | 15. Fifth metatarsal bone. |
| *4. Astragalus. | 16. Fourth metatarsal bone. |
| 5. Scaphoid. | *18. Globular head of first metatarsal bone. |
| *6. Internal cuneiform bone. | 19. Globular head of fifth metatarsal bone. |
| 7. Middle cuneiform bone. | 20. First phalanx of great toe. |
| 8. External cuneiform bone. | 21. Terminal phalanx of great toe. |
| 9. Cuboid bone. | 22. First phalanx of little toe. |
| 10. Os calcis. | 23. Middle phalanx of little toe. |
| 11. Articular surface of astragalus. | 24. Terminal phalanx of little toe. |
| 12. Tuberosity at base of metatarsal bone of great toe. | 25. Terminal phalanx of second toe. |
| | *27. Sesamoid bones. |

NOTES.

*1. See Plate XXIII. 9.

*2. See Plate XXIII. The external malleolus can undergo a change in its position if, for example, the foot is pressed to the floor, and if the inner side of the leg is brought nearer to the floor, as is the case in the extended leg, in the Athlete; through this the astragalus presses upon the elastic fibula, and the latter is somewhat forced away from the tibia, so that the distance between the two malleoli is increased (see plates of the Athlete, and the note to Plate VII.).

*4. On the upper surface of the same moves the lower end of the tibia (see Plate XXIII. 8).

*6. See Plate XXIII. 6.

*13. See Plate XXIII. 12.

*14. See Plate XXIII.

*18. See Plate XXIII.

*27. They lie under the head of the first metatarsal bone, and assist in forming the supporting point of the foot. Between the two runs the tendon of the flexor longus pollicis.

PLATE XXIV.

B. Muscles of the Foot.

Dorsal and plantar aspects.

- | | |
|---|--|
| <p><i>a.</i> Tendon of tibialis anticus.</p> <p><i>b.</i> Annular ligament.</p> <p>*<i>c.</i> Extensor proprius pollicis.</p> <p>*<i>d.</i> Abductor pollicis.</p> <p>*<i>e.</i> Extensor brevis digitorum.</p> <p><i>e'.</i> Tendon of extensor proprius pollicis.</p> <p>*<i>f.</i> Extensor communis digitorum.</p> <p>*<i>g.</i> Abductor minimi digiti.</p> <p>*<i>h.</i> Peroneus longus muscle.</p> <p>*<i>i.</i> Peroneus tertius muscle.</p> | <p>*<i>k.</i> Interosseous muscles.</p> <p><i>l.</i> Tendinous expansion of sole of foot.</p> <p>*<i>m.</i> Abductor pollicis.</p> <p><i>m'.</i> Tendon of same.</p> <p>*<i>n.</i> Tendon of long flexor of great toe.</p> <p>*<i>o.</i> Flexor brevis digitorum.</p> <p><i>o'.</i> Tendons of same.</p> <p><i>p.</i> Sheaths of flexor tendons.</p> <p><i>q.</i> Adductor pollicis.</p> <p>*<i>r.</i> Interosseous muscles.</p> |
|---|--|

NOTES.

**c.* Arises from the inner surface of the fibula, and is semi-pennate. Its tendon, which lies on the anterior border of the muscle, runs over the metatarsal bone of the great toe to the second joint of the same.

**d.* See Note "*m*" of this plate.

**e.* Arises from a tuberosity on the os calcis, and is partly covered by the tendons of the long extensor; it is divided into four portions, which pass into thin tendinous cords, and run obliquely inwards and forwards over the dorsum of the foot. They unite with the tendons of the extensor communis digitorum, and are inserted into the four outer toes. The larger part of the muscular belly is to be seen on the outer side of the foot in the neighbourhood of the malleolus (see Plate XXIII., and the plates of the Athlete).

**f.* Arises from the fibula and the outer tuberosity of the tibia. Its muscular belly is semi-pennate, and the tendon lies on its anterior border. The tendon is divided above the astragaloid joint into five fasciculi, of which the four inner unite with the short extensor tendons, and are inserted with the second, third, fourth and fifth toes (see Plate XXIII. *m*).

**g.* Arises from the plantar surface of the os calcis, and is inserted into the outer side of the first phalanx of the little toe.

**h.* See Plate XX., note *k*.

**i.* Arises from the outer and anterior sides of the leg, runs downwards and obliquely inwards through the annular

ligament, and then is inserted at the base of the fifth metatarsal bone.

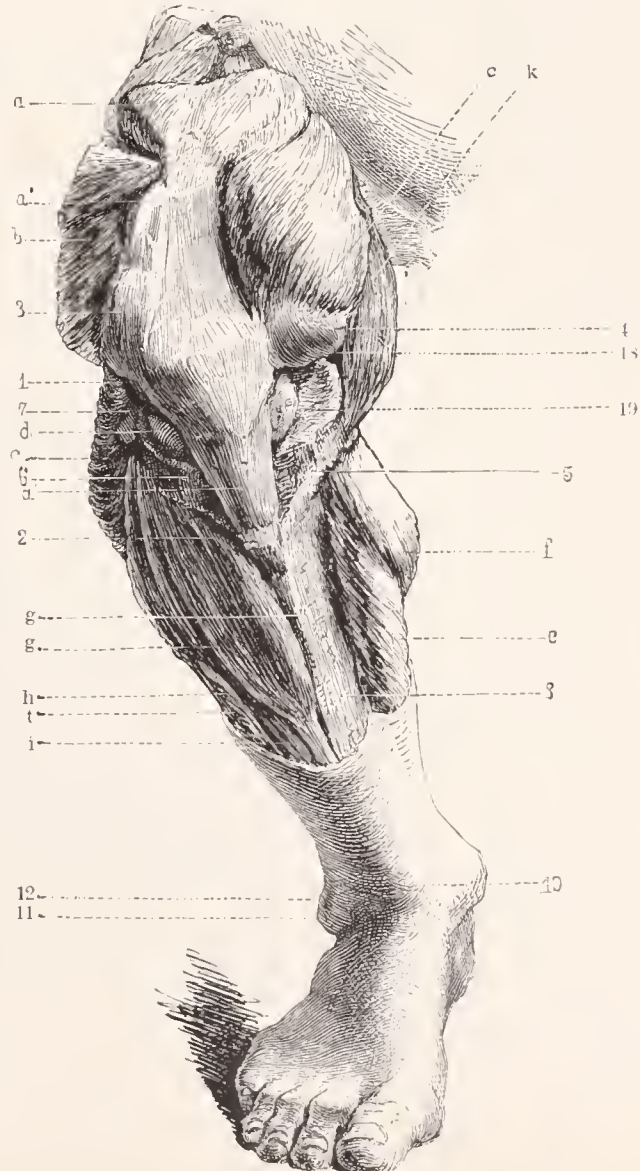
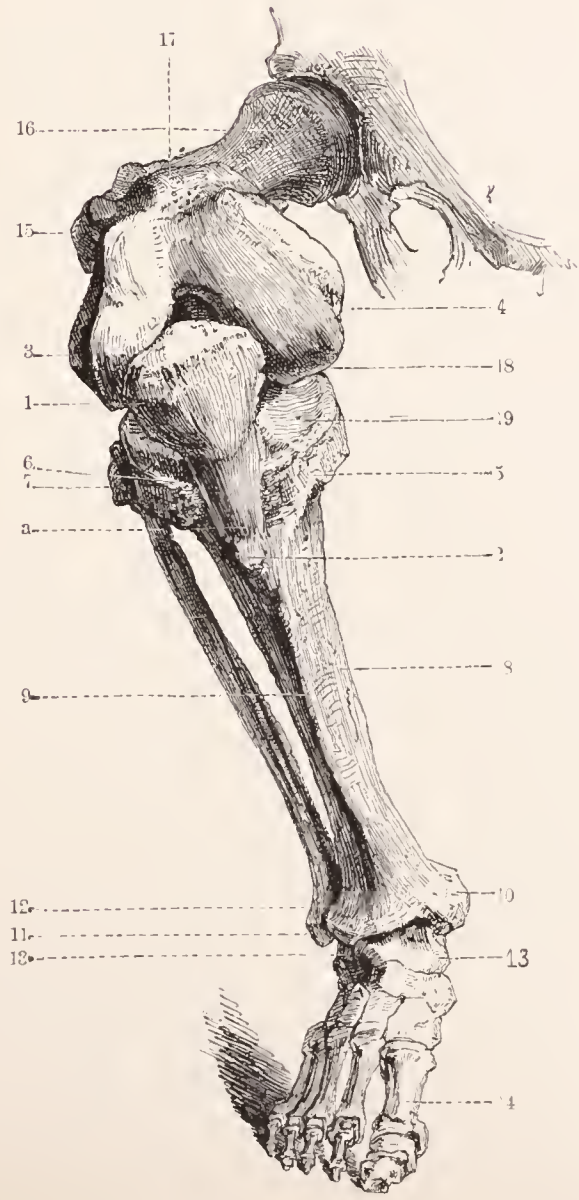
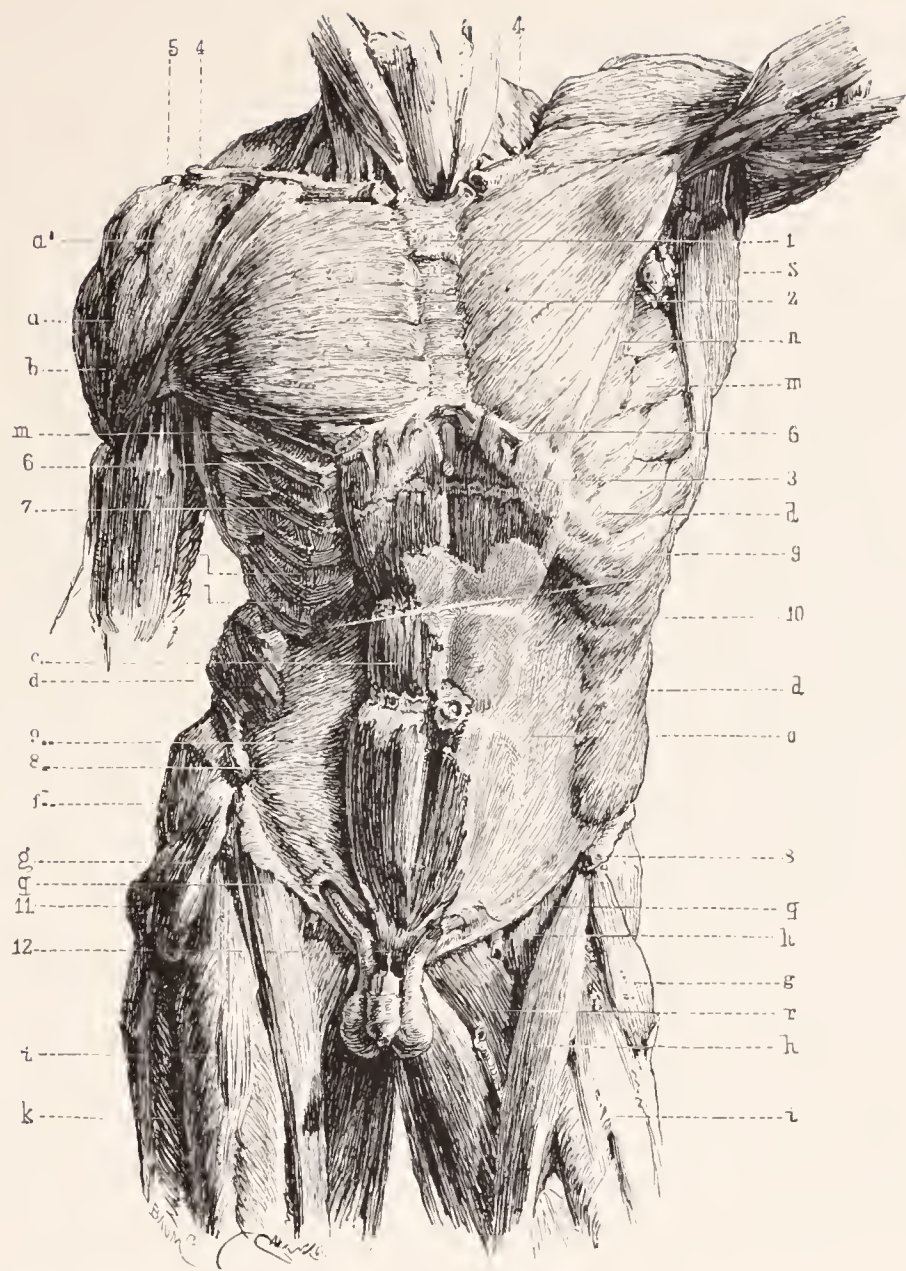
**k.* The three on the outer side arise by two heads from the corresponding metatarsal bones of the second, third and fourth interosseous spaces, and are inserted into the outer side of the first phalanx of the same toes. The three on the inner side arise only from the inner surface of the metatarsal bones, and are inserted into the first phalanges of the same. So that the external interosseous muscles are three in number and two-headed, while the internal ones are four in number.

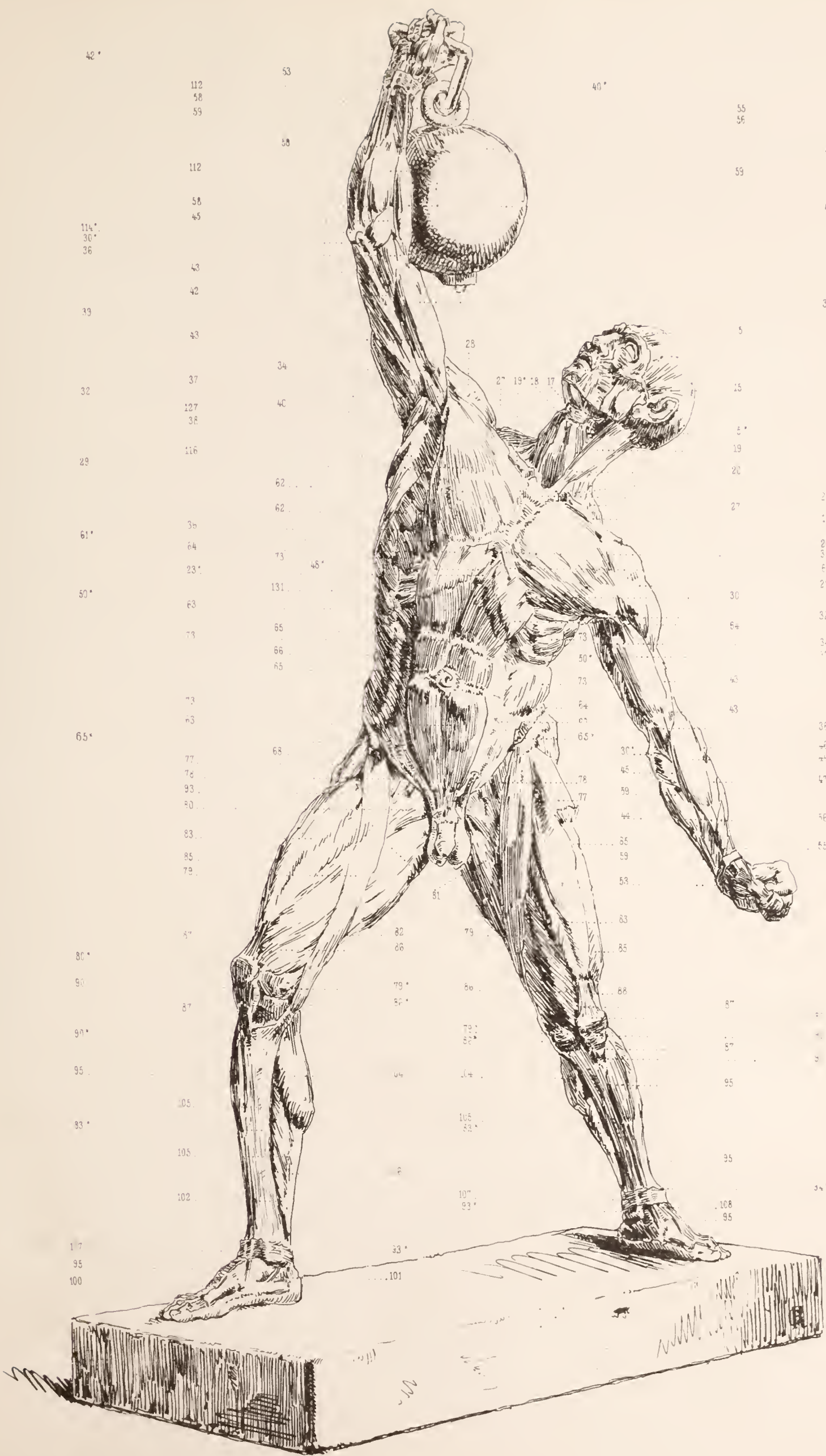
**m.* Arises from the inner rough surface of the os calcis, and terminates at the first joint of the great toe, near the sesamoid bone; it forms the inner boundary of the border of the sole of the foot.

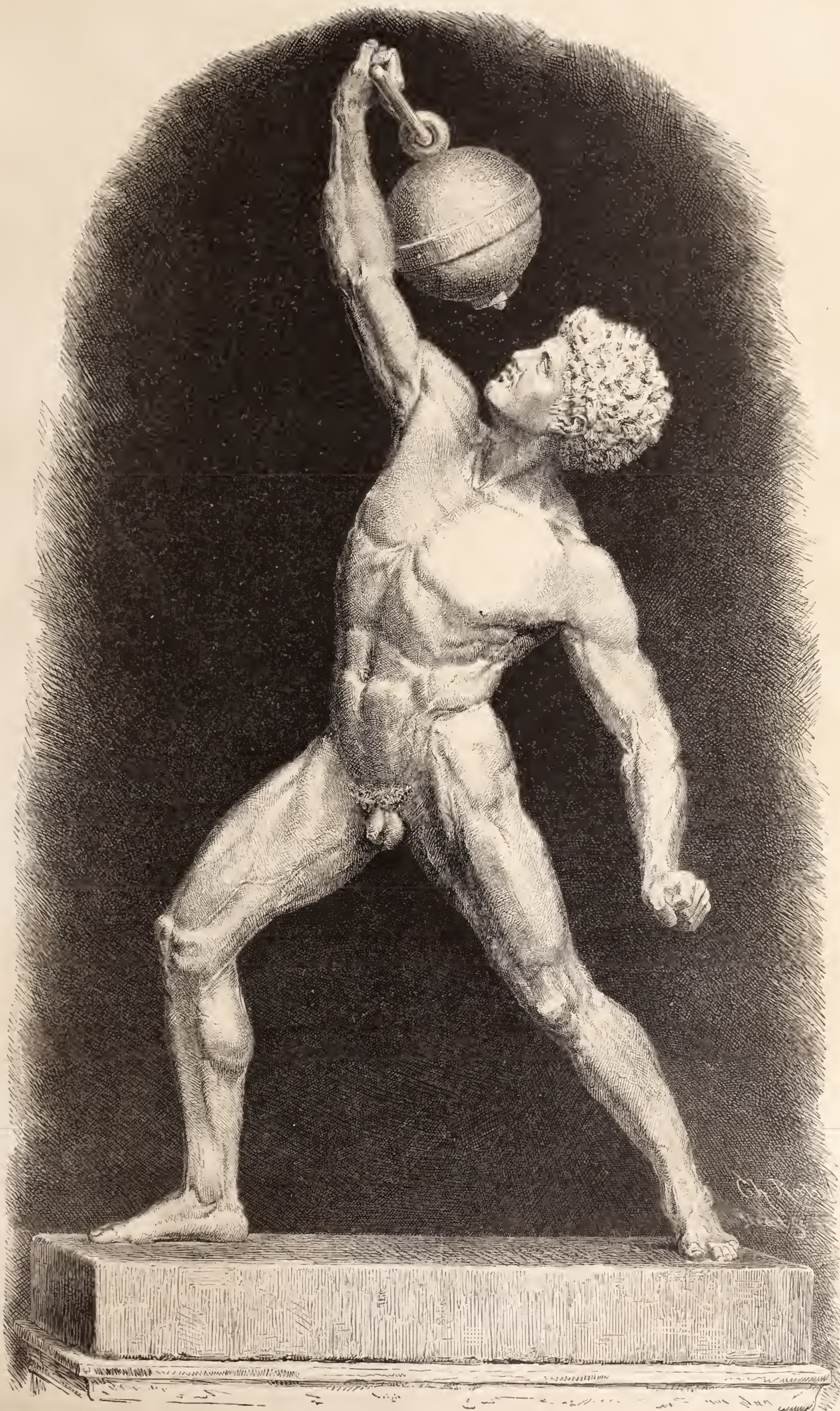
**n.* See Plate XXIII. *b*.

**o.* Arises from the lower surface of the tuberosity of the os calcis, and is divided in the middle of the sole into four tendons, which cover those of the long flexor and run to the second phalanx of the four outer toes. At the first joint each tendon is split, and through each of the clefts thus formed passes a tendon of the long flexor. The great as well as the little toe possess each a particular flexor muscle on the plantar surface; these, however, are of no importance to the artist, as, during the outward movement of the toes, little or nothing is seen of their action.

**r.* See note *k* of this plate.









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